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Journal of the Inventors' Institute.

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THE INVENTORS' INSTITUTE,
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Chairman of the Council—**SIR ANTONIO BRADY.**

THE various efforts which have been made, and the numerous influences now at work to injure, if not to destroy, Patent Rights; the inefficiency of the many well intended, but ill considered, schemes of Patent Law Reform which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor, without advantage to the Public; together with the proceedings so essentially involving the interests of inventors which have already taken place in Parliament, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organizing the influence of Inventors, Patentees and others. Its objects are:—

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APPLICATIONS FOR LETTERS PATENT.

⁂ In this list (Com.) means Invention communicated from abroad.

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur-street, Charing Cross.

On January 17th.—190 to 205.—R. B. Lee and A. Rogers. Manufacture of metal pillars, posts, masts, or poles for telegraphic and other purposes, and machinery employed in such manufacture.—H. H. Henson. Machinery or apparatus for shaping and punching strip or sheet iron.—F. Erskine and W. S. Denby. Gully or stench trap for preventing the escape of noxious effluvia or gases from drains or sewers, and for preventing the ingress of solid matters into the same.—H. Paddison. Construction of sea walls, embankments, breakwaters, docks piers, and other marine and river structures, and for the application of certain materials to those objects, which improvements and materials are also applicable to other useful purposes.—C. H. Perman and R. Whitaker. Metallic boxes, and in the manufacture of the same, and in handles and fastenings for metallic boxes.—T. Unsworth. Doubling machine for doubling (twisting) twofold, threefold (or any number of ends once twisted) of cotton, silk, spun silk, flax, worsted, or any other fibrous material.—E. Milner. Lubricating the parts of steam and other engines.—C. D. J. Seitz. Apparatus for, and method of, treating wood and other similar fibrous substances for the manufacture of half stuff and paper.—D. T. Osborne, and R. Palmer. New self-feeding air-tight stove for heating green-houses, rooms, and out-houses, and other buildings.—J. Shanks. Water-supply apparatus for jaw-boxes or sinks, baths, wash-hand basins, open boilers, drinking fountains, and street or court wells.—J. Kirkman. Apparatus for governing and regulating the speed of steam engines.—B. Porter. Pickers for weaving and in apparatus connected therewith.—W. F. Gedge. System of obturator cock for liquids, gases, and vapours, and an improved aerating faucet or vent peg of similar construction (com.)—J. T. Cardon-Wamain. Machine for breaking, stripping hemp, flax, Indian grass, and other textiles.—T. Horsley, junior. Apparatus for closing cartridge cases.—M. Williams. Manufacture of gas.

On January 18th.—206 to 227.—Sir J. Macneill. Construction of tramways and of vehicles to be employed thereon.—M. S. Masourine. Improved air chamber adapted to caissons used in the construction of the piers of bridges. (Complete specification.)—V. Schwarzenbach. Process of gilding on glass.—C. Weekes, C.E., and C. Barnard. Combining sticks or strips of wood for lighting fires.—R. V. Davies. Waste-water preventor for domestic and other water-closets. —E. W. Elmslie. Means of, and apparatus for, opening hermetically-closed and other cases, boxes, and cans for containing preserved articles of food or other goods.—T. F. Henley. Manufacture of meat extract.—G. Haseltine. Manufacture of white lead, and in the purification of carbonic-acid gas used in the said manufacture, and apparatus therefore (com.) (Complete specification.)—J. Cox and S. Cox. Process and apparatus for extracting and recovering oils, fats, and similar substances.—J. J. Nicholls. Apparatus for ventilating water-closets, a part of which improvements is applicable to other useful purposes.—L. Stevens. Process for forming carbonic oxide from oxhydrogen vapour or steam, and an apparatus for utilizing the same for heating purposes. (Complete specification.)—O. J. Backus and A. F. Sawyer, and A. M. Loryea. Application of motive power to sewing machines, turning lathes, and other light machinery, also including improvements in the mechanical construction of water wheels suitable for this purpose. (Complete specification.)—C. Farrow. Stoppering bottles for aerated or gaseous liquids.—R. G. Wells. Apparatus to be used in connection with theatrical and scientific exhibitions, applicable also to other purposes.—J. G. Hawkins. Apparatus used in the manufacture of gas. (Complete specification.)—H. Codd. Tramways —J. Dixon. Construction of the piers of bridges and viaducts.—J. Redgrave and D. Wright. Glass vessels and other articles to which taps, stoppers, and other attachments are to be applied.—C. George and H. Porter. Pediment or cistern barometers, and the means of filling the same.—W. R. Lake. Fireproof vaults (com.)—W. R. Lake. Fireproof safes (com.)—W. R. Lake. Sewing machines for the manufacture of boots and shoes (com.)

On January 20th.—228 to 238.—M. E. Bowra and T. Wood. Manufacture of elastic fabrics.—G. Rydill. Machinery and apparatus for dyeing, staining, and drying animal and vegetable substances, and for bleaching purposes.—J. Robey. New or improved charcoal to be used for purifying sewage and other foul waters, and for disinfecting and deodorising purposes.—T. Stone. Carding engines.—J. Bacon. Sheds or apparatus for drying bricks, pottery, or other articles. —G. Haseltine. Washers for screw nuts (com.) (Complete specification.)—J. Knight. Apparatus to be used in connection with the frames of umbrellas, parasols, and sunshades.—C. Brimley. Reaping machinery.—J. G. Stidder. Apparatus for drawing and preventing waste of water from pipes, mains, cisterns, and other sources, also ball and supply valves for domestic and other purposes. (Complete specification.) —A. M. Clark. Apparatus for working the switches or points of railway (com.)—J. H. Betteley and T. Sharer. Construction of railway carriages and other rolling stock, and apparatus connected therewith.

On January 21st.—239 to 248.—G. Wilson. Bending armour plates, and apparatus for that purpose.—G. Hookham and H. J. Hookham. Fastenings for metallic travelling boxes and other metallic boxes.—T. Wilson. Propelling tramway cars and other carriages or vehicles, and in the apparatus or machinery to be employed therein or connected therewith.—W. S. Batley. Machinery and apparatus for making bricks, tiles, or other similar articles.—G. W. B. Edwards. Machinery for distributing artificial manure and guano.—L. P. Muirhead and R. J. Wood. Counter or machine for registering the revolutions and speed of engines and other machines.—H. J. Puckle and R. Fennelly. Aëriel tramways.—J. Napier. Apparatus to be used in lieu of a coffer-dam for making excavations under water, and for excluding water for other purposes.—R. H. Johnson. Apparatus for transmitting signals, and for opening and closing cocks and valves, which improvements are specially applicable to the prevention of railway accidents (com.)—J. Robertson. Machinery or apparatus for forcing, exhausting, or measuring air, gas, or other fluids or liquids.

On January 22nd.—249 to 259.—J. Stead. Rotatory engines.—B. Boothroyd. Method of sizing and painting laths for venetian blinds and other articles with any kind of liquid colouring.—R. Elmsley. Electric communication between railway trains in transit and stations or termini, and the apparatus connected therewith.—B. H. Foster. Steam engines.—H. Kesterton. Construction of steam boilers.—E. Riley and W. T. Henley. Puddling furnaces, and apparatus and appliances connected therewith.—H. C. Rose. Apparatus to be applied to horse-shoes, to prevent horses from falling upon slippery surfaces.—W. E. Newton. Breech-loading fire-arms (com.)—A. V. Newton. Apparatus for applying steam to the raising and forcing of water and other liquids (com.)—A. Gutensohn. Process for obtaining salt of tin and other products from waste or refuse of tin-plate.—G. Haseltine. Dressing and furrowing millstones (com.) (Complete specification.)

On January 23rd.—260 to 279.—R. Fairburn. Washing or scouring wool or other fibres.—S. B. Jones. Preventing railway accidents as by persons entering or leaving carriages.—G. W. Halfpenny. Manufacture of incombustible paper, ink for writing on the same, and covers and envelopes for the said paper or other paper when made into books or packages.—W. Ireland. Casting of steel ingots for wheel tyres (com.)—E. Hale and C. Matthews. Rolling iron or other metals.—S. Feather. Fire grates.—F. Jacobson. Treating sewage for the purpose of making manure and purifying sewage.—J. Cumming. Apparatus for separating sheets of paper from a pile and feeding or moving them into or through printing, folding, ruling, embossing, envelope-making, and similar machines.—H. Williams. Utilization of the waste heat from coke ovens, for the manufacture of soda ash, caustic soda, and for other similar purposes. E. Borlase. Apparatus for separating metals and metallic ores from other substances. (Complete specification.)—Sir W. Fairbairn and T. Beeley. Steam boilers.—R. S. C. Jelley and R. C. Jones. Tenon-cutting machine.—W. E. Sudlow. Construction of steam engines.—R. Pitt and F. Cox. Manufacture of leather and apparatus for that purpose.—R. H. Patterson. Purification of coal gas.—J. Watson. Operating tramway points, and the means employed therefor.—E. Grey. Increasing the magnifying power of microscopes.—J. C. Browne. Propeller blades for the propulsion of vessels.—A. Clark. Corrugated metal revolving shutters, and the grooves in which they work.—W. R. Lake. Railway breaks and apparatus connected therewith (com.)

On January 24th.—280 to 291.—T. Bull. Washing machines.—R. Hatful. Preventing and removing incrustation in steam boilers.—E. C. Hinds. Prevention of accidents on railway station platforms, either by persons standing too near edge, crossing line of rails, opening of carriage doors before the train stops, or getting into carriage after the train is in motion.—J. S. Jones. Apparatus or means to be used for basting meat whilst roasting.—G. Gibbs and T. Pitt. Breech-loading fire-arms.—C. H. Twynam. Apparatus for working railway signals.—G. Clark. Metallic or other vessels used to preserve, cook, or contain articles of food, and partly available for other substances.—P. Brotherhood. Applying steam power directly to centrifugal and other rapidly revolving machines, and apparatus therefor.—E. H. Huch. Soup farina.—G. Gibson and J. Vowell. Governors for regulating and controlling the speed of steam and other engines.—W. R. Lake. Refrigerating apparatus (com.)—T. Stead. Washing machines, and washing and wringing machines combined.

On January 25th.—292 to 308.—J. C. Bayley. Tuyeres.—T. T. Bailey and H. Waddington. Safety lamp for miners' use.—T. W. Grieve. New or improved method of locking the joists of a stage.—W. E. Gedge. System of alarm adapted to chimney and other clocks, termed independent alarm clocks (com.)—Major-General H. Y. D. Scott. Obtaining fertilizing substances.—E. P. H. Vaughan. Construction of keys for securing the rails of railways (com.)—T. Longworth and F. L. Jones. Looms for weaving.—J. Tester. Machinery for cutting chaff and other similar vegetable substances.—W. R. Lake. Clothes wringers, parts of which improvements are applicable to other apparatus or machinery (com.)—W. Dennis. Apparatus for forcing and discharging water, air, and other fluids and gases for extinguishing fires, and for other useful purposes.—J. Coxeter. Apparatus for administering nitrous oxide gas previous to surgical or dental operations.—G. Haseltine. Hinges and their application to folding desks, and the construction of such desks (com.) (Complete specification.)—A. A. De Ware. Umbrella and parasol frames.—J. H. Johnson. Torrefaction of animal substances for the purpose of manufacturing manure therefrom, and the apparatus or means employed therein (com.)—J. Middlemas. Clerical costume.—J. Burgess. Metallic handles for crochet needles and fastening or connecting crochet needles to their handles.—A. Wightman. Horse-shoes.

On January 27th.—309 to 323.—J. Imray. Steam boilers (com.)—H. A. Bonneville. New and improved artificial stone or cement, called "cement of magnesia," to be used in aquatic or other buildings, also moulded and made applicable to ornamental, architectural, and other purposes (com.)—A. Defeher, widow. Domestic utensil for shaping and ornamenting butter and pastry.—F. Erskine and W. S. Denby. Steam boilers and apparatus connected therewith, parts of which are applicable as a motive power, also boilers for heating purposes, and fuel economizers for heating the feed water of steam boilers.—H. Theaker and S. Osborne. Apparatus for forging or shaping metal.—R. Girdwood. Appliances for illuminating by means of gas.—G. W. Hart. Apparatus for generating steam.—A. Kolb and C. Allsop. Means of rendering closets and other places inodorous, and the arrangements of appliances for the purpose.—W. R. Lake. Breakwaters (com.)—E. H. Bentall. Chaff cutter.—J. H. Johnson. Self-setting animal trap (com.)—A. M. Clark. Machine for scouring and polishing wire (com.)—E. T. Hughes. Combinations of textile or fibrous threads, and for the machinery or apparatus connected therewith (com.)—H. Lewis. Machinery or apparatus for making boots and shoes.—S. Haley and S. H. Haley. Machinery or apparatus for "boarding," "softening," and "breaking up the grain" of hides and skins.

On January 28th—324 to 344.—H. Smith. Apparatus connected with feeding bottles for infants and for other purposes.—J. Imray. Subjecting substances to heat, for effecting continuously drying, roasting, calcining, evaporating, distilling, gas producing, and other like operations, and apparatus therefor.—G. Haseltine. Process for converting cast iron into steel (com.)—W. Wharldale. Stoppers for bottles.—T. Smith. Processes and furnace with appliances for the economical production of baryta (com.)—G. Rydill. Steam boilers, steam generators, furnaces, and apparatus for generating steam, heating fluids, gases, and for other purposes, for obtaining motive power and applying heat.—H. H. Gibbs. Manufacture of driving straps or bands.—B. Latham. Purifying sewage, and treating products obtained therefrom for the production of manure.—A. Bernstein. Apparatus for effecting electric contact by passing trains or carriages on rail or tramways.—A. Bernstein. Apparatus for controlling switches.—A. M. Silber. Apparatus for lighting and heating purposes.—J. H. Toulson and T. Harmer. Means employed for freeing glass from carbon, grease, or other substances that may adhere to its surface.—J. Sokolnicki. Lamps and apparatus for burning mineral oils or other inflammable liquids.—W. Walton. Rolling and combined rolling and drawing wire.—G. Olley and W. Jackson. Water heater by exhaust steam.—R. Wittig. Dividing apparatuses on carding machines.—W. E. Newton. Spinning machinery (com.)—W. Joslin. Furnaces, and the method of charging them with fuel, to improve its combustion and prevent smoke.—P. A. Blake. Self-acting fire-alarm. J. Hosking. Safety valves.—D. A. Carr and P. Barlow. Railway electrical signal apparatus.

On January 29th.—345 to 359.—R. J. Markham. Carriage wheels, to be called "Markham's combined wheels.—J. Middlehurst and J. Middlehurst. Mechanical means of the process of the ingathering of the potato crop and other roots, and at the same time cleansing the roots so gathered from the adhering soil, and depositing them in hampers or other receivers for ready storing.—G. Young. Lamp lanthorns and in the lenses used therein, the same being also applicable to lighthouses.—R. Todd and C. Braithwaite. Improved Kendal tapestry carpeting with any number of weft shoots of woollen, linen, or cotton.—H. B. Sears. Apparatus for surfacing mill and other stones.—J. F. Fairclough and H. Fairclough. Apparatus for separating flour from middlings or sharps.—G. Haseltine. Submarine torpedo launches and apparatus connected therewith (com.) (Complete specification).—S. Smith. Apparatus for showing the number of passengers by public or other conveyances, and for enabling the amounts of their fares to be checked, which apparatus is applicable also for checking the attendances of workmen and others at workshops and other places.—C. Davis. Preventing vessels or ships foundering or sinking at sea.—C. Davis. The method or means of saving life or property at sea.—A. M. Clark. Sifting shovels (com.) (Complete specification).—J. H. Johnson. Lamps for burning heavy oils (com.) (Complete specification).—G. Leach. Machinery for preparing and carding wool.—G. Leach. Construction and arrangement of apparatus or appliances to be used on board fishing vessels for facilitating the operation of sea fishing.—G. Leach. Machinery for preparing wool.

On January 30th.—360 to 373.—H. H. Murdoch. Explosive powder or compound, and the mode of preparing the same (com.)—J. Clark. Railway breaks.—W. B. Dick. Apparatus for extinguishing fires.—J. Huxtable. Turn-wrest plough.—G. Peacock. Chain cables.—J. Paterson. Steam trap.—R. S. Prowse. Axles and axle-boxes for wheeled vehicles.—J. Bennett. Feed-water heating apparatus for steam boilers.—A. M. Clark. Manufacture of artificial stone for building and other purposes (com.)—W. T. Eley. "Boxer" breech-loading and other cartridge cases.—J. Richardson and J. Watson. Puddling and rolling mill furnaces.—W. R. Lake. Fire-alarm and water-supply apparatus for preventing conflagrations (com.)—D. Jones. Apparatus for forcing in liquids or fluids, applicable to forcing inflammable fluid or liquid into furnaces of various kinds and at various pressures, whether of kind or degree.—J. C. Edwards and J. Taft. Machinery for preparing and cleaning cotton or other fibrous material.

On January 31st.—374 to 387.—J. Stirling. Apparatus for working railway breaks.—W. Gedge. Machines or apparatus for blocking boots and half boots or bottines (com.)—G. Rydill. Fuel economisers, feed-water heaters, and surface condensers, also for heating air and for other purposes.—J. Neill. Making of lump, loaf, or block sugar, and the machinery employed therefor.—J. Ibbetson. Lavanting machines used in the manufacture of leather, artificial or otherwise.—T. B. Kay and F. Mills. Carding engines for carding cotton and other fibrous materials.—T. Lyne. Moulding bricks. L. Strange. Presses for pressing cotton and other materials into bales (com.)—J. H. Rhodes. Liqueur frame or stand for containing liqueur and other bottles.—G. Duncan and W. A. Wilson. Printing machines.—W. Foster. Machinery or apparatus for preparing wool or other fibrous substances for combining or spinning.—J. Broel. Apparatus for lighting and heating.—E. Jones. Cartridges.—J. B. Hamilton. Construction of reed pipes for organs.

On February 1st.—388 to 497.—R. G. Heaton. Compound multiplying fishing reel with revolving handle plate.—G. Platt. Improved mode of imparting ornamental effect to chandeliers, branches and other ornamental gas fittings, and which said improvements are also applicable

(*Continued on page* 19.)

Scientific and Literary Review,
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MARCH 1, 1873.

FREEDOM OF CRITICISM.

"BRITONS never shall be slaves" is the cuckoo-cry of our port-wine politicians, oft resounding in the ears of after-dinner audiences, who frequently take it up with musical honours, fully expressive of appreciation of their own superiority over the unhappy people belonging to nations "not so blest" as that of the free-born Briton. Notwithstanding all this, when one is no longer at "high jinks," but soberly pursuing, with observant mind, the practical business of life, it becomes a matter of some difficulty to ascertain exactly how, and in what, it is that the subjects of this realm differ so advantageously from those of neighbouring States in this matter of freedom. They certainly have considerable latitude as to religious worship—so much so indeed that, even what is termed the National Church by law established, is liable to be transformed into an arena for the exhibition of the ultra-dogmatic and ceremonial vagaries of its ministers whenever they think it worth their while to attract attention and gather up pecuniary help for these vagaries by appealing to the prevailing love of novelty and sensuousness. Indeed, in the various ways in which a man may make a fool of himself, considerable latitude is still allowed, and even some protection is by law accorded; for it has *quantum suf.* of pains and penalties in store for anyone who dares, in regard to another person, to "write him down an ass." But, in other matters of personal liberty, the amount of freedom which the excessive multiplication of petty legal restrictions has left us is by no means large; there are but few actions of ordinary every-day life in which the officers of Law and Order cannot authoritatively intervene—from the knocking at one's own door and ringing one's own bell to the firing off a gun in one's own garden. In short, the modern invasions of personal liberty are only saved from becoming practically unbearable principally in consequence of the great number and bewildering variety of these restrictions preventing our police officers from having any clear conception of the wide extent of power entrusted to their use, of which their batons are the forcible symbols.

Perhaps nothing is more often boasted of than our freedom of speech and freedom of the Press; but it will be found, upon examination, that even here there is more of the appearance than the reality of freedom. Not only are we restricted as regards public speech in public parks and other places of public resort; but, according to recent legal decisions of high authority, we must not open our mouths in regard to any matter which may be pending in our Courts of Law, and must reserve the expression of our views and opinions till the matter has been adjudicated upon, when of course they will be of no value or practical importance to the case.

As to private speech, we are just as closely "cabined, cribbed, confined" as in public speech. It is legally dangerous to warn anyone against the dishonesty of another; and to tell a man of his faults may possibly render the teller liable to criminal punishment as a provoker of a breach of the peace. As to the freedom of the Press and of public criticism—which, now that we have undertaken to range through, not only the fields of science, but also those of literature in general, is to us a subject of practical importance—how do we stand? We have not, it is true, any Censor of the Press, nor do we receive police warnings; but we have to write, so to speak, with halter round the neck in the shape of a possible prosecution or legal proceedings against us if we greatly displease anyone whose works we criticise; and when we find, as in a recent case, large damages, with heavy law costs, is the punishment meted out for severity of criticism, we begin to feel that an editorial chair is likely to be, in time to come, no bed of roses for ourselves, however we are firmly resolved to do our work honestly and with all the ability we possess—avoiding timorous reticence on the one hand and excess of duty on the other; seeking, if possible, to attain to better friendship with friends and to the respect of foes, if we should be unfortunate enough to make any. Certainly, in no case shall we ever allow our criticisms to be swayed by personal prejudices or extreme views of our own; for, although we are the advocates of freedom and liberty, we are utterly averse to the licentious abuse of those most sacred rights of humanity. Still, when we find, as in more recent cases, that there is no certainty whatever about the result of Press prosecutions or anything connected with the position and liabilities of publishers—as it appears that a person libelled or aggrieved, if he has been outspoken in his enunciation of views of the position of our political or social systems which are distasteful to what are termed the "respectable" classes, rendered himself obnoxious, he will find that the sympathies of almost everybody are against him, and the result may be an adverse verdict or a nonsuit. So that prosecutions of this kind seem to have more of the "glorious uncertainty of the law" about them than even patent cases or horse cases.

Indeed, if any coherent system in reference to these matters can be eliminated from all that passes in our Courts of Law, and amongst those who rule over us, it would appear to be a system which shall secure that no expression of public opinion shall be legally allowed except it finds utterance on the Judicial Bench, within the walls of Parliament, or by the deliverances of our governors. At present, however, people look to the public journals for expressions, if public, and "Othello's occupation's gone" if a journal refuses to publish any such expressions.

We do, therefore, hope that our Legislature will be pleased to consider the state of our libel laws, and so provide that, when fairly and honestly endeavouring to perform a public duty a man may not be liable to a ruinous penalty for simply being mistaken as to the scope of that duty—in short, be called upon to bear a heavy punishment for a small offence.

Reviews.

Recent and Actual Commerce, 1789-1870. Also, The Growth and Vicissitudes of Commerce, B.C. 1500—A.D. 1789.

By Dr. Yeats, Asssisted by Several Gentlemen. London: Virtue and Co.

Dr. Yeats treats any subject he undertakes to handle in such a thoroughly exhaustive manner, and with so much detail and comprehensiveness, that it is very difficult to present the public with such a Review of his works as shall enable any one to form a correct idea of the value of their contents.

Doubtless, the present works are in a great measure compilations, and when the reader has perused them he will be in possession of all that has been published on the matter treated by nearly every writer worthy of attention.

The following quotation from "Recent and Existing Commerce" relates to the little kingdom of Belgium, whose industrial enterprise, commercial activity, regard for the rights of inventors, and liberal, one might even say, orderly, yet almost democratic, political system, renders it a pattern State for Europe.

The resentment of the Dutch for many years interposed an additional barrier to friendly dealings. The capital invested in Belgian enterprise was withdrawn, and much of the trade between the two countries entirely ceased. Such was the case with coal, which the Dutch formerly obtained from Belgium, but now receive from Germany. Belgium had also to assume a considerable portion of the Dutch debt, amounting to 83,000,000 guilders, and an annual contribution of 400,000 guilders. Thrown on its own resources, the little kingdom did not despond. It possessed many countervailing advantages. It had the densest population in Europe, so closely packed that Philip II. once exclaimed of the country, "This is but one great town." Its roads and canals were admirable and numerous, and rendered carriage everywhere easy. To these means of communication was added a well-devised railway system, carried out with skill and economy, under the control of the Government, at a time when England was wasting enormous sums over railway schemes devised on no regular plan. The people were happy in their king and government, for although there could be little national feeling amongst races that differed in their origin and language, and had been governed by foreign powers for several hundred years, yet the new constitution was well administered, and the reigning prince devoted himself to the prosperity of his adopted kingdom. The sentiment of loyalty implanted by the king has taken root, and the people are now as proud of being Belgians as once of being inhabitants of Bruges and Ghent. To meet the deficiency of capital the Government instituted a society (Sociéte Génerale de Commerce), with powers to make advances for carrying out industrial objects, and also founded a national bank. By these means new undertakings and manufactures, some of an extensive nature, were encouraged and sustained. A series of reverses occurred in the years 1837 and 1838. Numerous mercantile failures took place, a brief panic ensued, and the Belgian bank suspended payment. The resources of Belgium were happily too sound and certain for the national prosperity to be permanently injured. The crisis stimulated the people to seek new routes for trade. Commercial intercourse with France was gradually resumed, and in the course of a few years this trade was nearly equivalent to all the rest of the foreign traffic of the country.

Commercial intercourse arose with Austria, the shipments being chiefly cloth to the port of Trieste, for further consignment. Belgian vessels visited the distant empire of Brazil, and the English settlement of Singapore: but very little profit appears to have resulted from these ventures, as a commercial treaty with Brazil was not considered worth renewing in 1841, and the intercourse with Singapore has fallen off.

Time soothed the ill-feeling between Belgium and Holland, and a renewal of commercial intercourse benefited both kingdoms. Cloth, coal, iron, metals, glass, and furniture were taken by the Dutch; the Scheldt was again opened to vessels of Antwerp; and a treaty of commerce was concluded between the two kingdoms, whose relations continue to be altogether amicable.

In husbandry and its connected manufactures, the cultivation of flax, and the making of linen, rank first in importance. To increase the growth of the fibre, and to seek the most improved modes of its manufacture, are objects of solicitude with the Government. Extensive mills, with the newest inventions in machinery for spinning flax, were erected as early as 1834, and the industry expanded every year, till 40,000,000 lbs. of the fibre, of the value of 25,000,000 florins, are annually produced. Three-fourths of this quantity keep the national spinning mills and looms in activity, while 10,000,000 lbs. supplied the foreign demand for yarn.

Brussels, the industrial as well as political capital of Belgium, produces a variety of fabrics, of which its lace and tulle are unsurpassed. Lace-making, in particular, has, for many generations, been a costly and beautiful art, to which the taste for luxury in dress, prevailing throughout Europe, and created by the rapid accumulation of wealth, has given an extraordinary impetus. Wool and woollens form another important industry in Belgium. Fine cloths used to be amongst the most eagerly sought-for products of Flemish skill. The long period of Spanish oppression reduced this manufacture to its lowest point, but with freedom it has again risen to be second only to that of linen. Neighbouring countries have, however, in the meanwhile, so improved their woollen cloths, that Belgium has not yet resumed its former place in the markets of the world. A large quantity of cloths is sent, notwithstanding, to France, and also to the United States. Cotton manufactures, in consequence of the fibres being imported from England, advanced slowly at first, but have now become of even more importance than the flax and woollen industries. Metal working is the next great manufacturing industry of Belgium. This is facilitated by the great stores of coal, which, excepting those of England, are the most abundant in Europe. On account of the almost vertical tilt of the strata, the coal is obtained from a continually deeper depth, and not laterally, as in English mines. The mineral resources of Belgium appear to be without limit, and the skill exercised is such that some of the English iron trade has gone thither, and England herself has been supplied with locomotives from Liege, a town sometimes called, from its iron works, the continental Birmingham.

Belgium has made unavailing efforts to plant colonial settlements. The present king, when Duke of Brabant, showed great interest in such designs, and continues to favour them. Even without colonies, the kingdom has commercial relations with every country in the world. Its chief trade is with France. In 1865 this had risen to the value of nearly £18,000,000, imports and exports combined, or between thirty and forty per cent. more than it was in 1861. With Great Britain, in the same year, the value of the commerce was above £14,000,000, an increase of nearly £2,000,000 over that in 1864. The Belgian trade with Holland, Russia, Germany, and the two Americas is likewise very extensive, and continues steadily to increase. Belgium exports to France cattle, coal, linen, and woollen fabrics, and receives in return cereals, wines, flax, silks, and wool. The chief imports from England are cotton and yarns, besides many miscellaneous articles. Amongst the exports to England are those contained in the following table:—

In 1870 Belgium supplied:—

Cattle, sheep, and swine ..	146,000	head.
Meat, and poultry, and game	3,092	tons.
Eggs	15,000,000	
Fruit	11,470	tons.

This provision trade has declined of late years, although the general trade of Belgium with England has largely increased. The value of exports to England in 1870 was £11,247,864, and of imports of British produce and manufactures, £4,481,079.

We have no space for further quotation at present, and will, therefore, conclude this review by saying that those who wish to become fully acquainted with the past and present position of Commerce and Industry should consult these works of Dr. Yeats.

Physical Geography for the Use of Beginners.

By William Hughes, Professor of Geography in King's College, London: Author of "A Manual of Geography," &c. [Gleig's School Series.] London: Longmans, Green, and Co. 1873.

Mr. Hughes' reputation is so high, that when we say this is a most valuable educational work, we shall only be making a statement that every one would expect to find recorded in our pages. Mr. Hughes truly says:—"The most satisfactory feature in the geographical tuition of the present day is found in the increased attention given to the study of the earth's natural aspects, phenomena, and productions—in other words, to Physical Geography. It is in good books of travel, the work of competent observers of nature, that the best materials for satisfying the want thereby created on the part of the learner are most readily found, and it is from such sources—aided by the experiences and generalisations derived from many years devoted to tuition, as well as to geographical inquiries in general—that the writer of this 'Physical Geography for Beginners' has drawn the aid necessary to his purpose. In its general design and mode of treatment, the plan followed is in harmony with that pursued in the case of the descriptive geography which formed one of the earlier numbers of Gleig's Series—'Geography for Beginners'—by the same writer.

We must, however, confess that we are no admirers of the plan of separating Physical Geography, which is the "dry" part of the subject, from General Geography, which is more captivating to the student. And we would suggest that if science-education could be pursued in a somewhat similar style to that adopted by Rev. W. S. Symonds in his "Records of the Rocks," formerly reviewed in our columns (see page 4, present vol.) it would lighten the work of both teacher and student.

The work treats successively of the Aim of Physical Geography; Land and Water; Mountains and Highlands; Lowlands; Rivers and Lakes; the Ocean; Climate; Geographical Distribution of Plants and of Animals; Earthquakes and Volcanoes; Geographical Distribution of Man, &c.

Catechism of Zoology.

By Rev. J. F. Blake, M.A., F.G.S., Mathematical and Natural Science Master, St. Peter's School, York. London: Longmans, Green, and Co. 1873.

This is a useful little work of an elementary character, referring to a branch of knowledge which has far less attention bestowed upon it than it deserves. From its preface we learn that it is intended to contain such main facts only as it may reasonably be hoped may be retained in the memory of such as have gone through a course of Zoology, until by the study of particular branches they can verify or supplement them by their own observation.

It is not intended to be used alone, but as a summary of what has been enlarged upon by a teacher or related in a text-book. It may be also useful as furnishing categorical answers to questions which can only be answered by inference in many cases from an ordinary text-book.

Nowhere more than in Natural History is it true that no rule is without exception—such exceptions to a general statement, when considered important, have been indicated by the qualifying words, "almost," "generally," &c., but some have been passed over as tending to confuse the idea of the general truth.

The classification adopted is nearly that of Nicholson's Manual, to which the author acknowledges himself to be much indebted, but modified, where thought advisable, with the authority either of Owen's "Comparative Anatomy," Huxley's "Outlines," or Rolleston's "Forms."

These intentions and views Mr. Blake has satisfactorily succeeded in carrying out.

Prize Essay on the Balance Spring and its Isochronal Adjustments. (Baroness Burdett Coutts's Prize.) By MORITZ IMMISCH. London: E. and F. N. Spon, 48, Charing Cross. New York: 446, Broome-street.

[CONTINUED FROM OUR LAST.]

The detached escapements, as they were invented and gradually improved, reduced the friction, that great enemy to steady motion, to a minimum. The emancipation of the balance and spring from the influence of the maintaining power permitted the conditions of their motion and their relation to each other to be considered as separate features; by means of inferences the remaining friction in the escapement became a known quantity with determinable limits, which could, by turning the acquired knowledge of the properties of the spring to a proper account, be successfully contended with; and what was before quite illusory—the realization of the much-cherished idea of determining the longitude by means of a watch—became now more feasible. We see watchmakers of that period exerting their utmost skill to attain that end, the large reward connected with it no doubt acting as a powerful stimulant to their energies.

The spirit of controversy being aroused, various and sometimes contradictory theories were advanced in books and pamphlets. The principal aim still seemed to be the further perfection of the escapement, and it makes one sad to think that so much incessant labour should have been thrown away without directly furthering the end in view; as, for instance, in the case of Mudge, who constructed a rêmontoir escapement so bold and original in conception as to find, simply considered in the light of an ingenious mechanical contrivance, scarcely a parallel in the whole history of watchmaking.

This memorable period of competition was, notwithstanding the frequent mistakes, productive of results extremely salutary to the advancement of horology as a science. Failures of some artists served as examples not to be followed, marking a path to be avoided, and inducing others to look for success in other directions.

The detent escapement being almost exclusively adopted for chronometers, as combining the least friction with the greatest simplicity, the balance spring now received a greater share of attention than heretofore.

Up to the time of Arnold, balance springs were made in the flat spiral shape. With him originated the cylindrical helical spring. The ends of this spring are bent inwards, forming a curve, within the circular space of the coils; the greater or lesser abruptness of these curves affects greatly the action of the spring in long and short vibrations, and is therefore determinable by the exigencies of each case.

Somewhat later the Breguet spring made its appearance, deriving its appellation from its inventor. The body of this spring is flat, but the outer coil is bent upwards with a gentle sweep; at some distance from the flat part of the spring it again forms a knee downwards, in order to bring its lengthy parallel to the plane of the spring; from there it is bent inwards, forming a curve gradually tending toward the centre, similar to that formed by the ends of the helical spring.

I have to mention another spring, which, on account of its form when seen sideways, is called the spherical spring. It was invented by Houriet, a Swiss watchmaker. While in the cylindrical helical spring all the coils, except the curved ends, are of equal diameter, the diameters of all the coils of a spherical spring are different from one another, being largest in the middle and lessening towards the ends.

The specific advantages and disadvantages of these different forms of springs will hereafter be gone into.

I may here mention that the cylindrical form has, with very few exceptions, been adopted by English makers for marine and pocket chronometers, and the high reputation of superiority the English chronometer enjoys, and always has enjoyed, speaks volumes in its favour. One of the principal advantages afforded by this form of spring consists in the facility with which it permits those manipulations to be performed which are necessary to enable the spring so to control the motion of the balance that the long and short vibrations are performed in equal times.

This state of uniformity is called isochronism. We find that it is practically impossible to procure equal arcs of vibration for any length of time; the gradual increase of friction on account of the thickening of the oil will soon make the vibrations fall off, and in the case of pocket watches, the motion imparted to the balance while being carried and the varying friction in different positions cause a considerable fluctuation in the length of the arcs; and as, in order to obtain a steady rate of going, any given number of vibrations, whether long or short, must be performed in a given time, it is evident that isochronism is the most important feature connected with balance springs.

After alluding to the diversity of opinion, existing as to the principles of isochronism, the author proceeds:—

One of these so-called principles is the prevailing idea that isochronism solely depended upon a certain length of the spring; that too short a spring made the small vibrations slower than the long, and too long a one caused the watch to lose in long vibrations. This is so far from being correct, that sometimes in the case of a very long flat spring, it is a matter of the greatest difficulty to make the long vibrations slow enough to arrive at isochronism, while a shorter spring offers more scope for any manipulation tending to that end. Everyone with some experience in timing, knows that mere length has absolutely nothing to do with isochronism, and if, nevertheless, we frequently meet with this assertion in books on watchmaking, it proves that it was simply copied from other books, without having been tested by the writer.

Another very general idea is that isochronism is an inherent property of the balance spring. This is also incorrect, and to assume that, because by means of the spring isochronism can be arrived at, the conditions constituting isochronism must be looked for in the spring, is not quite but nearly as wrong as if anybody was to assert that, because licorice cures cough, the conditions constituting cough must be looked for in the licorice.

I have already mentioned the difficulties Cumming, nearly 100 years ago, experienced in accounting for the different performance of springs when in connection with different escapements, and the very natural and sensible conclusion he came to; and although escapements of the present day are far superior to those of that time, there still exists sufficient difference between them to make it a matter quite out of question, for instance, that a balance and spring perfectly isochronous while attached to a chronometer should retain this quality when attached to a lever escapement, unless it was by the merest chance, *viz.*, if the chronometer was badly constructed and the lever escapement in a state of perfection, the difference being so proportioned as to make the sum of friction in the one amount exactly to that in the other, otherwise, and under ordinary circumstances, the balance spring perfectly isochronous in the chronometer would be sure to perform the long vibrations quicker than the short ones in the lever watch; but it is not at all necessary to bring the balance and spring in connection with different escapements in order to prove that the resistance in the escapement modifies the isochronal conditions, as carefully conducted experiments with one and the same escapement will show that every increase and decrease of friction affects the motion of the balance in long or short vibrations more or less sensibly.

A still greater factor in this respect is the balance itself; and before I consider it in its relation to isochronism, I think it advisable to make some general remarks concerning it.

When a balance without a spring is brought into connection with a chronometer escapement and turned in the direction of unlocking, the escapement will cause it to revolve round its axis. There is first of all a certain amount of force required to overcome the *inertia* appertaining to all bodies at rest; *this is a dead loss*, and irrelevant as this may seem to many who have applied themselves to the study of the laws of isochronism, there will also be those who, by inference and actual observation, have found that great importance attaches to this point, and that it bears directly upon the subject of isochronism, as will appear hereafter.

The impulse given, the balance revolves round its axis with a speed greater or less according to the greater or smaller proportion the propelling power bears to the resistance to be overcome; after a whole revolution it presents itself to another impulse, and arrives at this point with a velocity somewhat less than that with which it started, the loss arising from the friction of the pivots, the resistance of the air, and the unlocking of the escapement. To this velocity another impulse is added, which causes the second revolution to complete itself much quicker than the first; the diminution of speed caused by the retarding influences already mentioned, is now much less apparent, as the greater momentum acquired by the balance enables it to overcome them easier, and soon the balance acquires so much force of its own as to leave no perceptible trace of lessening of speed between the commencement and the end of each revolution. This is, however, under the presupposition that the balance is of some considerable weight and diameter: different balances will behave very differently in this respect; a more substantial one has a greater capacity for retaining and accumulating any force transmitted to it, and will consequently exercise a greater controlling power over the impediments in the way of uniform motion.

In all cases, as impulse is added to impulse, the velocity will go on increasing until a maximum is reached, where the speed remains stationary. After what has already been said, it is evident that a slighter balance, owing to its more yielding nature, will arrive at this point of uniformity sooner than a more substantial one; but irrespective of the time required by different balances to arrive at this maximum state of velocity, that state itself is determined not only by the sum of the various influences already mentioned, but also by the inertia of the escape wheel and train, which has first to be overcome by the motive force, causing a loss of time.

This loss is of no importance when the

motion of the balance is slow, as the acting tooth of the escape wheel will then come in contact with the pallet as soon as the latter has fairly entered the circle of the former, and the balance receives the full benefit of the impulse as it is acted upon through the greatest possible arc; but as the velocity of the balance increases the pallet will enter the circle of the escape wheel quicker and will have proceeded farther in it before the sluggishness of the escape wheel and train has been overcome, and in proportion as the "drop" increases, the effectiveness of the impulse decreases, until at length it is counterbalanced by the above-mentioned retarding influences, and the motion remains stationary. It may be as well to mention here that in the case of maximum speed, the resistance of the air is a more important retarding agent than when the motion is slower, as it increases in the ratio of the squares of the velocity.

All these conditions determining the limits of the various influences acting upon the simple motion of a balance, remain in full force when this balance is connected with a spring. In the case of a *vibrating* balance the number of these conditions is naturally augmented by circumstances originating with, and various properties appertaining to, the spring.

Mr. Immisch further considers the principles of the balance spring, and afterwards gives detailed particulars as to the construction and action of balance springs, in some instances supplying illustrative engravings.

General Literature.

Notes of Thought. By the late CHARLES BUXTON, M.P. Preceded by a Biographical Sketch. By the Rev. J. Llewelyn Davis, M.A. John Murray, Albermarle Street.

THE biographical sketch furnished by Mr. Davis for this volume is a model of plain, honest, manly writing. It is not critical in the ordinary sense, that is, the writer does not sacrifice his subject to himself by a conceited appraisement of his powers and qualities or any dogmatic assertion as to the position Mr. Buxton is to occupy amongst the notable men of England in the present or the future. Mr. Davis tells his story without any kind of pretension, and with as near an approach to a just and, at the same time, an appreciative estimate of his friends character as a man and as a writer as interests the reader by its warmth, without in the least offending him by any undue partiality.

There can be no doubt that the late Charles Buxton was a kindly, affectionate, benevolent, and observant man, who saw clearly what was passing around him, and jotted down his remarks on men and things in a clever, readable way. His personal peculiarities were not very striking. His love for dumb animals being shared by large numbers without perhaps extending to rattlesnakes, and even Mr. Buxton's wide affections gave way before these reptiles. Charles Lamb spoke of his imperfect sympathies because he could not, without an effort, include Scotchmen and Jews amongst his most intimate personal friends. Mr. Buxton went far beyond this, however, and in all directions made friends of men, beasts and birds; of every creature, in fact, in which the capability of loving or suffering could be supposed to exist.

The "thoughts" which constitute the chief portion of this volume are frequently acute, sometimes common-place, often not very accurate, and seldom, if ever, profound. Still they are written in a spirit so kindly and charitable, so free from cant or bigotry of any kind, so shrewd and pleasant in relation to the daily occurrences of life, as well as to the general run of public questions, that few readers will close the book without being pleased and improved by its perusal. Some of the longer "notes" may almost be called essays, and these, as a rule, deal seriously with serious questions, but they are much too long to reproduce. We shall have to content ourselves with what is more compressed and portable. There is probably truth as well as beauty in the following:—

"There is reason to believe that, instead of the unfathomed caves of the ocean being black with outer darkness, they are ablaze with golden splendour. The creatures brought up from tens of thousands of feet below the surface, are singularly phosphorescent, and it is probable, nay, almost certain, that every movement of every living being in these abysmal depths flashes out brilliancy." The same praise cannot be awarded to the following, which we cannot help regarding as a very grave mistake in regard to man and the world he inhabits:—

"The microscope is almost as humbling as the telescope. The microscope shows that the race of man is as paltry in point of number as the telescope shows his habitation—the earth—to be in point of size." Humbling truly to ignorant human vanity, but not to man as an observant and reasoning creature. And certainly not humbling to him who sees only cause for wonder and love in contemplating the works of the Creator in the minutest atom, as in the great scheme of creation so far as man is capable of contemplating it. The following flies slightly wide of the mark:—

"Many a man has been led into Atheism by the very idea of the goodness of God. Not being able to square that idea with the mercies of life, he has thrown up his belief in God altogether. The truth is, it is easier to disbelieve in God than to disbelieve in His goodness." This, perhaps, is not altogether a mistake, as there is no knowing what may be the condition of certain individual minds; but is it not more true that a vast majority of those who are called Atheists are really not so, and have only abandoned a belief in certain attributes and actions which they suppose, perhaps mistakenly, the general run of believers accept as belonging to the Almighty? We frequently give a name to what we cannot explain, but where we can only guess it is as well to guess as charitably as possible. Can this be true? "Live with the cleverest men of the day—artists, statesmen, authors, bishops, judges, generals; during a whole month put down every striking and original remark you hear; if you cover a sheet of foolscap I'll eat my hat." This, of course, must depend in a great measure on the amount of information possessed by the listener. Mr. Buxton, no doubt, met large numbers of the people he refers to, but it is not on record that he ever ate his hat. It may, therefore, be safe to assume that the observation is justified. The following is more curious than profound:—

"I should like to know from young ladies which is the best—to be flirted with and forsaken, or not to be flirted with at all. I suspect the former—they do so dearly like being made much of." Perhaps its true answer may be found in Tennyson—

> "'Tis better to have loved and lost,
> Than never to have loved at all."

Here is something worldly, but useful:—

"That, on a great scale, taking men in millions, good feeding helps both mind and morals is clear. Man is one being. What sets his body right, in the long run, sets his soul right. Beef and beer turn into manliness. There was never a brave, self-reliant, wise people with pinched bellies."

Again—

"Many things help to make a nation rich. Safe harbours, deep rivers, rich soil, fine climate, wise laws, long peace, and so forth; but no one thing fills the bag so fast as truthfulness."

This is not a volume to read through; but it may be frequently taken up during leisure moments, and never without some degree of profit.

The Life and Letters of St. Francis Xavier. By HENRY JAMES COLERIDGE, of the Society of Jesus. Burns and Oates, Portman-square.

THE lives of saints are not, as a rule, pleasant reading; and however they may at one time have suited the contemplative and credulous portion of the world, in the present stirring and critical times we turn from them as too much of a tax on our time and temper. It would be wrong, however, in this matter not to discriminate. One or two saints of the more modern time must be excepted, as they come before us with so much gentleness and good sense, that were they to be considered merely as gentlemen and men of the world, we could not refuse them our admiration for their benevolence, sweetness of temper, and wit. St. Francis de Sales is one of these, a man who assumed nothing, was always true and natural, and who rebuked offences in others by the uniform gentleness and uprightness of his own life rather than by verbal assumptions of holiness. Some of his sayings, as recorded by Camus, Bishop of Belley, constitute maxims of life of the very highest and best kind. "That sincerity which is not charitable," he observes, "proceeds from a charity which is not sincere." Also, "If you must fall into any extreme, let it be on the side of gentleness." Again, "It is far better to be good and simple than shrewd and mischievous." One more: "If an action may be considered in more lights than one, always choose the most favourable." The sturdiest Protestantism we are sure would stand uncovered in the presence of such a kindly Catholic saint as this.

St. Francis Xavier, of whom the present volume treats, was also a man of kindly nature, and full of true Christian gentleness. Born at the opening of the sixteenth century, in Spain, of a good family, he grew up to be a man of high intellectual qualifications, pure mind, and blameless life; he afterwards, with others, joined Loyola in founding the Society of Jesus, and was, during the whole of his life, one of the most active of that famous society. Mr. Coleridge traces his career with a loving hand, but with too much obtrusive admiration, as, apart from his fine natural character, it is difficult to see in him anything beyond the honesty, sincerity, and purity of motive with which he laboured, according to the fashion of the age, to promote the interests of religion, especially by the conversion of the heathen. The manner in which his present biographer speaks of his penances may be edifying to readers of a particular turn of mind, but it is not difficult to imagine what an ordinary English reader would say of the following spiritual exercise. It appears, that when a youth amongst the scholars at Paris, he was vain of his great agility in running and leaping and other exercises, and to punish himself for this sin, he bound cords round his arms and thighs, which he did not remove when he started with his companions on a journey from France into Germany. The pain he underwent was so severe, that at last he sunk under it. When examined, it was found that the "cords had buried themselves deeply in his flesh, which had swollen round them so that they were hardly visible, and the surgeons who were called in despaired of being able to cut them. His companions betook themselves to prayer, and the next morning the cords were found to have broken of themselves, and the swelling had passed away." For some time he and his companions laboured in works of charity. At Vicenza he fell ill, and had a vision of St. Jerome, who told him of the different places he was to labour in, and of the crosses and trials with which he was to be troubled, all of which possibly came to pass just as foretold.

One of the great turning points in his life was his mission to India, and in relation to this we have very full information furnished by his letters. The manner of his conversions are nearly always rather curious.

Amongst the Paranas, a woman in danger of death through childbirth was prayed over and baptised by our saint, and safely delivered, whereupon the whole village was called on to embrace the new religion, but "they said they could not venture to leave the religion of their ancestors without the permission of their master. Then I went to the steward of the chief, who happened to be there to exact some taxes due to his lord." This man "declared that he thought it a good thing to be a Christian," though he was not inclined to be one himself. "However, the chief people of the place, with their whole households, were the first to embrace the faith; the rest followed their example, and so all of every class and every age received baptism." We are told after this of many very extraordinary things, especially of his having preached to as many as thirty different peoples in thirty different languages, speaking to each in that which it understood. The following extract will furnish further information relative to some of the extraordinary labours of our missionary saint:—"The number of his miracles on the fishery coast and in the adjacent parts was so great, we are assured that they would of themselves fill a large volume. Some few of the most signal of these miracles may be rapidly mentioned. A beggar, covered with sores and putrid wounds, asked an alms of him; and Francis washed him with his own hands and drank some of the water, and sent him away perfectly cured and sound. He was about to say mass in a little church at Combutur, when a crowd entered with a corpse of a boy who had been drowned in a well. The mother threw herself at the feet of Francis Xavier, who had baptised her child, and implored him to restore him to life. After a short prayer he took the dead child by the hand, and made it arise. The child rose up at once, and ran to his mother. One of two youths who accompanied him as catechists was bitten at night in the foot by a cobra di capello, was found in the morning to be dead; Francis touched the foot with the saliva from his mouth, made the sign of the cross over him, took him by the hand, and bade him rise in the name of Jesus Christ. He rose at once, and was able to continue on his journey immediately, as if he had been simply asleep. There are more cases related of his raising the dead in this part of the country; and it is even stated in the processes that one of the children whom he used to send about in his name to the sick raised two dead persons to life."

Of course there is much in this volume as to the rules and government of the Jesuits, their objects and proceedings; but the details of the life and labours of St. Francis fill the chief part of it. The miracles we have given are thickly scattered throughout the whole book; and it would appear that the good man believed very honestly in his power to actually perform some of those attributed to him. It may be remarked, however, as very likely that his credulous and superstitious admirers, as was the habit of the time, touched up ordinary facts, until they assumed the appearance of edifying and useful miracles. The following, which is the last we shall refer to, reads very oddly as a manifestation of supernatural power, and in the present day would not count much to the credit of its author. In his journey from Meliapor to Malacca, "a soldier was on board very fond of cards, which were in great request to cheer the tedium of the passage. One day he was very unlucky and lost, first, all his own money, and then a large sum, some hundreds of crowns, which had been committed to his care by a merchant of Meliapore, to be conveyed to a correspondent at Malacca. When all was lost, the poor man broke out into blasphemies against God, and then sank into a deep melancholy, which brought him to the point of throwing himself into the sea. Francis was told of his danger; perhaps, as was so often his wont, he had been looking on at the game, talking with the players and by-standers. He took the man aside, and began to comfort him as well as he could, but it seemed impossible to make him resigned. Then Francis borrowed fifty reals of a friend, and brought them to him with a bright smile on his face, telling him to go and try his luck again. Before the play began, he took the pack of cards in his hands, turned them over once or twice, and then gave them to the players. This time the luck was all on the side of the soldier, who soon won back all that he had lost. He was going on with the game, when Francis forbade him to continue, and taking him aside, spoke to him sweetly and gravely of the risk which he had run of throwing away his soul as well as his life. The man became truly penitent, and never touched cards again."

Whether reading of this kind, even when narrated to illustrate the life of so good a man as St. Francis Xavier, is in any way profitable, we shall leave to our readers to decide, as we shall also leave to them the question as to the intelligence and common sense of those for whose edification this volume was written. Mr. Coleridge, the author of this book, was, we believe, educated as an English Protestant gentleman, but has since gone over to the Church of Rome. His right to have done this is unquestionable, as all honest changes of opinion are justified by the motives by which they are prompted. He is now a member of the Society of Jesus, in ordinary phraseology, a "Jesuit." In this, also, his right cannot admit of question. But without censuring the change mentioned, or its motives, we think we may fairly question the intellectual or moral profit of a proceeding which has fitted an educated and clever man for the production of a work which so strongly evidences qualities of mind utterly at variance with the acquired knowledge and habits of investigation, characteristic of the century in which he lives.

Memoir of a Brother. By Thomas Hughes. Author of "Tom Brown's School Days." Macmillan and Co.

It is needless to say that a work from the pen of the author of "Tom Brown's School Days" has in it many charms apart altogether from the interest of its subject. It would be difficult to describe accurately all that constitutes the special charm of style and thought so characteristic of Mr. Hughes, but when we claim for him earnestness, clearness, manliness, and an unaffected sincerity in regard to what he has to say, and a delightful simplicity and strength of utterance in saying it, we ask no more than is fairly his due. His first and best work, "Tom Brown's School Days," is, perhaps, the best boy's book ever written. In saying this we are not comparing it with such old favourites as "Robinson Crusoe" or "Gulliver's Travels." It has scarcely anything in common with these, and is altogether different in intention and effect. "Robinson Crusoe" was written by a man, for boys, and its interest belongs chiefly to its literalness—its matter-of-fact style, as a vehicle for incidents which are remote, strange, and startling. The boy-mind is most delightfully deceived by the air of truth given to such strange incidents by the circumstantiality and seemingly scrupulous exactness of the writer. But throughout the whole current of the narrative the boy is carried out of himself, and beyond his own experience. And, although there is much good moral teaching by the author, it does not touch the young reader as naturally arising in his own conscience by his own reflections on his own conduct.

In "Tom Brown's School Days" the thing is altogether different. It is a book written by a boy for boys. Its wisdom does not seem unnaturally united with the trusting simplicity of youth. Its thoughtless heartiness when play is on, and the game is the only proper thing to be thought about, is what every man will remember in himself, but which no man but Mr. Hughes has ever been able to describe in the boy's spirit and tone, with a boy's directness and simplicity of spirit, with nothing avoided but those exuberances of feeling and extravagances of manner which make the best boys sometimes rather too much for staid men, in their graver moments.

The present volume, in a certain sense, may also be called a boy's book, inasmuch as it was written for the author's own sons, and for his nephews, the sons of the dear lost brother, with the incidents of whose life it deals, whose memory he, no doubt, desires to have held in reverence by the young people to whom he addresses himself.

The author was born thirteen months after his deceased brother, and from childhood they had been playmates, school-fellows, and college companions. The story of their lives is told with great simplicity, and it is clear from the adventures related, and the snatches of letters given, that George E. Hughes was a fine, frank-hearted, honest, courageous youth, equal to any need required by duty. The way in which Mr. Hughes works out the contrast between himself and his brother George is really very interesting. The following extract we are sure will be relished, not only for the exquisite little story it contains, but also for the reflection by which it is closed:—"My form (at school) had a lesson in the early Greek history to get up, in which a part of the information communicated was, that Cadmus was the first man who 'carried letters from Asia to Greece.' When we came to be examined the master asked us, 'What was Cadmus?' This way of putting it puzzled us all for a moment or two, when suddenly the words 'carried letters' came into my head, and, remembering the man with the leather bag who used to bring my father's papers and letters, and our marbles and whip-cord, from Farringdon, I shouted 'A postman, Sir.' The master looked very angry for a moment, but, seeing my perfect good faith, and that I had jumped up expecting to go to the head of the form, he burst out laughing. Of course all the boys joined in, and when school was over I was christened 'Cadmus.' That I probably should not have minded, but it soon shortened into 'Cad,' at which all the blood in my eight-year-old veins was on fire. The more angry I was, the more some of the boys persecuted me with the hateful name, especially one stupid big fellow, of twelve or so, who ought to have been two forms higher, and revenged himself for his place amongst us little ones by making our small lives as miserable as he could. A day or two after, with two or three small boys for audience, he had got me in a corner of the playground, into which he kept thrusting me violently back, calling me 'Cad,' 'Cad,' while I was ready to fly at his throat and kill him. Suddenly we heard a step tearing down the gravel walk, and George, in his shirt-sleeves, fresh from a game of rounders, rushed into the circle and sent my tyrant staggering back with a blow in the chest, and then faced him with clenched fists, and a blaze in his eye, which I never saw there more than two or three times. I don't think many boys or men would have liked to face him when it was there. At any rate, my persecutor didn't, though he must have been a stone heavier, and much stronger. . . . George went back to his rounders after looking round, and saying 'Just let me hear any of you call my brother "Cad" again. I don't think I ever heard that nickname again at our first school, and it must have been very shortly after this he wrote home, 'I find I like Tom better at school than I do at home, and yet I do not know the reason.'

The strongest and most generous natures are always fondest of those who lean on them."

The account given of the college time, time spent in sports, and in the beginning of a professional career—very soon terminated—all bear evidence of the same kindly generous, strong spirit. But a part of the book which will be interesting and profitable to all fathers as well as sons, is that containing the letters written by the father, John Hughes, to his sons, Tom and George, particularly those to George, whilst at school. In all senses they are manly, as well in their affectionate approvals as in their tempered and wise censures. Every circumstance connected with the life of George Hughes was calculated to beget in him the many fine human qualities he possessed, and in this record of him and his doings, given to us by a loving brother, much will be found useful beyond family limits. The "uprightness and downrightness" of much that it contains will, it is to be hoped, influence many lives yet in England, and assist with other influences in shaping a character for Englishmen, and a future destiny for England, honourable to herself and profitable to the world. We give the following as a specimen of his fun sent as a valentine to his son, at Rugby, in the February of 1872:—

This is the month when little Cu—
—pid robs us of our senses, Oh!
'Tis he inspires me to renew
My doleful strains of love to you,
Oh, charming, fascinating, cru—
—el Walter Jacky Mansfield Hugh—
—es, Scholæ Rugbiensis, Oh!

I learn to dance and sew, while you
Are learning Latin tenses, Oh!
How I should like to dance with you,
Instead of with my frightful grew—
—some governess, Oh, charming cru—
—el Walter Jacky Mansfield Hugh—
es, Scholæ Rugbiensis, Oh!

I'm sure the least that you can do
To calm my nerves and senses, Oh!
Is (though 'tis slightly overdue)
To take this little *billet doux*,
And be the valentine so true
Of her who signs herself your Su—
—san, charming, fascinating cru—
—el Walter Jacky Mansfield Hugh—
—es, Scholæ Rugbiensis, Oh!
YOUR SUSAN.

The Mormons and the Silver Mines.

By JAMES BONWICK. Hodder and Stoughton.

THERE is not much that may be called new in this work, and perhaps the most curious part of it, that wherein the writer deals with special eccentricities of creed, and the people who have originated them, and who constitute their sectaries, will be least liked by the general run of readers. Certainly, Mormonism is not a subject that English people, as a rule, take much pleasure in discussing, and yet, Mormonism, being a very positive, and a very curious fact in life, it is right that intelligent readers should understand it. It is not to be believed that such a system can last, and notwithstanding the prosperity and comfort of its people, it is clear that the differences of opinion already spreading amongst them, encouraged by the influx of strangers brought by the Pacific Railway, will, in a little time, destroy the worst features of this system, and ultimately bring things back so as to assimilate with the ordinary conditions of American society. America is a country where, through lack of labour, inventions of all sorts will be greatly stimulated, new ingenuities in connection with daily work will find daily application. But it is just as natural that new ideas, eccentric thought, and every possible variety of moral or immoral suggestion should seek to clothe themselves in fact. We have a religious system in England which is constituted of many sprouts from the old root of the Established Church. In America they have no Established Church, and they have the most thorough freedom of opinion. What wonder, therefore, if, where the conditions of life include a fuller personal independence, there should be a more adventurous statement of thought, and a more general disregard of what may be approved of by society generally. Mr. Bonwick looks with much charity on the many moral curiosities he describes. Society has never been able to correct these things by harshness, and frequently, to say nothing of the means adopted, it has sought to subdue the better by the worse. Brigham Young's marriage scheme does not affect us much; and Mrs. Woodhull's extravagances are, perhaps, not much worse than the state of things revealed by our Divorce Court. Much purification in society is needed, and whilst we may very sincerely deplore certain of these American extravagances, our prime duty is to see what we can do for reformation at home. Mr. Bonwick's book, on the whole, is worth reading, not so much for its geology, as for the strange social glimpses it gives us into certain conditions of American life, but it requires to be read with a patient and understanding temper.

Words and Works in a London Parish.

Edited by Rev. C. ANDERSON, M.A. Henry S. King and Co., Cornhill, and Paternoster-row.

THIS handsome volume consists of a number of papers on various subjects connected with the religious and moral welfare of the people, which are republished from a local periodical called the "Soho Magazine." They are short and numerous, and for the most part written by Ministers of the Church of England. It may be said, however, in their recommendatien, that they are nearly altogether free from that style of thinking and speaking so common amongst seriously disposed people, especially ministers of religion. Indeed, many of the papers are of a very high class, and quite worthy a serious study by those who take an interest in that kind of parish work by which they were called forth. A paper called "A Christian Aspect of Strikes," by Rev. Harry Jones, in which the views of the writer only want the correction of practical experience to render what he has to say thoroughly sound and useful, is worth reading. He sees clearly the right as insisted on and exercised by the small trades of London, but he misses the clearly thought-out policies, and more thoroughly recognised responsibilities understood by the men belonging to the great staple industries of the country; men by whom combination is carried on with scientific exactitude, and who calculate the consequence of every step they propose to take, because they know how necessary it is to study and respect all interests if they would serve their own interest faithfully and well. The paper in this volume to which we feel disposed to call attention, is that on "Labourers' Combinations from a Christian Point of View," by J. Llewelyn Davis. It is really an admirable argument in favour of labourers' movements for the purpose of bettering their condition, whilst, at the same time, it points out the difficulties our farm labourers of the present day have to contend with in seeking to enforce their claims by combination. What he says as to the difficulties belonging to unskilled operatives combining applies to them, however, only when labour is superabundant; when the surplus has been carried off by emigration, or by a transference of their labour from one part of the country to another, or from one occupation to another. Union is as easy to agricultural labourers as to any other class of workers; and it is more than likely that the drain now going on to the United States of America, as well as to the British colonies, will soon make under-supply an almost chronic condition of the labour market in our agricultural districts. The subjects in this volume are much varied, and it may be said with truth that it does not contain a single paper which will not well repay attentive perusal.

Old-fashioned Ethics, and Common-sense Metaphysics.

By WILLIAM THOMAS THORNTON, author of a "Treatise on Labour." Macmillan and Co.

THIS, as might be expected from the pen of so able a writer as Mr. Thornton, is a very clever book. It is nearly altogether controversial, and flies at very high game, but it would be venturing too far to say that the author always succeeds in his attempts on the strong positions of those against whom he levels his attacks. Utilitarianism is a subject which has been beaten dry, and remains somewhere about where it was when first brought before the notice of the public. No doubt the old ethical form is sometimes superior to the new, as the household treatment of old ladies is sometimes superior to the highly-skilled efforts of the scientific practitioner; but it would be dangerous to push this too far, even in regard to utilitarianism, as in the definition of a new word, and the explanation of its many significations, we get an understanding of the idea it is meant to represent better than if we stuck to the old phrase with its limited meaning. The article on "History's Scientific Pretensions," running as it does into the oldest of all puzzling discussions, "free will and necessity," is ably done, but it is only one more specimen of ten thousand able disquisitions on the same subject; and no more closes the way to further verbal controversy on the subject than the clouds of to-day will shut up the heavens against those of this day next year. To that subject there is verily no end, and the "last man," if he has time to think about it, will be as much puzzled as we now are as to how he should decide in the matter. On David Hume, as a metaphysician, Mr. Thornton is rather severe; but in treating of the doctrine connected with the association of ideas, he does not thoroughly penetrate the subject by recognising the continuous changes which take place from infancy upwards, and which, through new combinations, show changes in thought as curious as those produced by chemical processes. Into the confutation of Professor Huxley's protoplastic theory, we dare not follow Mr. Thornton. He is very deep, and has raised some points that may even present themselves as difficulties to Professor Huxley himself; nor would it be safe to touch on the more dangerous parts of the book where religion and its opponents are discussed. The writer has the calmness of scientific habit, and deals with the men whose opinions he exposes with very commendable quietness of temper; and were it for no other reason than this, and the great clearness of view by which the book is characterised, it is well worth a careful perusal by those whose studies lead them in this direction.

Old and New London.

Cassell, Petter, and Galpin: Ludgate-hill, London, E.C., and 196, Broadway, New York.

THIS publication is of a very pleasing and instructive character, but we are compelled, by want of space, to abstain from saying more at present.

The Little Dressmaker.

Fashions for Children and Dolls, edited by Mme. MARIE SCHILD. Containing a beautiful Illustration of the Latest Fashions for Children's and Dolls' Clothing, with the Cut Paper Patterns, &c. (February.) London: S. Miller, 37, Tavistock-street, Covent Garden, W.C.; and all Booksellers.

THIS useful and pleasing little publication continues to sustain its character for utility, adding to usefulness some entertaining remarks on subjects that will be well appreciated by mammas and all who are given to babyolatry.

Shelley's Early Life. From Original Sources, &c. By DENIS FLORENCE MAC-CARTHY. John Camden Hotten, Piccadilly.

IT is always interesting to read about Shelley, not simply because like other men of genius his life was out of keeping with the ordinary routine of every-day experience, but rather because he was so young and so gifted,—so kindly and so amiable in his intercourse with men, and, at the same time, so daring and so uncompromising in dealing with their most cherished convictions. His enthusiasm for good, and his belief in the perfectibility of human nature, were beautiful traits in his character, whilst his own personal unhappiness, which never for a moment dimmed this burning faith in him, gave a charm to his short career on earth, and to crown all, his melancholy and premature death, whilst on an errand of friendship, left behind it a sympathy which, though withheld at the moment through prejudice and mistake, becomes stronger daily amongst those who study his life and works in a kindly and appreciative spirit.

Mr. Mac-Carthy's book is very much less interesting in its handling than in its subject. It certainly corrects several of the misstatements of Mr. Hogg, but it does this with so much uninteresting minuteness of detail, and with such a tiresome examination of trivial circumstances that we had almost as soon believe Mr. Hogg's rather spiteful insinuations on two or three matters than take the trouble of wading through wearisome pages of refutation, even when effectually worked out as Mr. MacCarthy, we are bound to say, does work them out.

The chief interest in this volume is when the attempt is made to find such of the early productions of Shelley as he scattered about when at Oxford, and in this, though much pains has been taken, very little, if anything, has been recovered. Some few letters and poems from the *Oxford Herald* are given, and the supposition that the poems are from the pen of Shelley is reasonable enough, though, were there no need of additional proof as to their genuineness, they would add nothing to the fame of Shelley as a poet, nor give an atom of additional interest to his works, even amongst his most enthusiastic admirers. The "Ode on the Death of Summer," whatever Mr. MacCarthy may think, is certainly not Shelley's. The phrasing is not his, neither is the music, and this verse, which is referred to as containing internal proof of its authorship, is about as unlike Shelley as anything can be. Speaking of Zephyr:—

Before Aurora's car you amble
High in air;
At noon, when Neptune's sea-nymphs gambol,
Braid their hair;
When on the trembling billows rolling,
Or on the smooth sands idly strolling
Or in cool grottoes they lie lolling,
You sport there.

We are quite certain that the "lolling," which is a vulgar phrase, and which is, at the same time, a wretchedly bad rhyme, would not be tolerated by the delicate ear of so refined a writer as Shelley. We could adduce from his writings, were it worth while, pages of poetry connected with elemental personifications every one of which would show that in Shelley's mind there was always a spirit of classic beauty, united with almost celestial harmony, which never, for an instant, permitted him to fall into commonplace vulgarity. If we read his "Autumn," a dirge as a contrast after this "Ode on the Death of Summer," we shall see at once how, in the very essence of it, everything differs from the clumsy, incomplete, and muddy imbecility of the "ode."

Really the most important, though not the most interesting, part of this volume is that which deals with Shelley's visit to Ireland in 1812, when he gave utterance to his sympathies with the Irish people. His opinions, as given by Mr. MacCarthy, from the newspapers of the day, were moderately expressed, and, upon the whole, such as at the present moment would attract no attention whatever. But it appears from extracts taken from his letter referring to this matter, that some of his language offended the more sensitive part of the audience, and that hisses were mixed with the applause by which his words were received. Shelley's "Address to the Irish people," and his "proposals for an association, &c., both interesting pamphlets, are given in full, and these, considering the youth of the writer, are remarkable manifestoes, indicating sound practical thought, as well as honest zeal on behalf of the people in whose struggles he took a very decided interest. But it may be seen at a glance that Shelley's ideas utterly disqualified him for working with such men as necessarily came to the front in a struggle where political strifes are embittered by sectarian difference, and where both forms of prejudice operate to produce every variety of offensiveness. Those who feel disposed to interest themselves in such an investigation as that contained in Mr. MacCarthy's book will find in it much with which to be pleased.

YATES' PATENT SAFETY LAMP.

THE object of this invention is to construct miners' lamps in such a manner that they cannot be tampered with or opened by the miner without first extinguishing the light, thus preventing all risk of explosions in the mine from an exposure of the naked flame.

To this end the inventor adapts to the body of the lamp a locking bolt, which will prevent the lower part from being unscrewed or detached from the upper part until such bolt is drawn back. This locking bolt is constantly kept pressed forward by means of a particular spring, and is provided with an arm which bears against a shoulder or block on a screwed pin which works the wick carrier up and down; this screwed pin is provided outside the lamp with a milled head, whereby it can be turned.

When the lamp has been trimmed and lighted, the oil reservoir must be screwed into its place in the upper part, the locking bolt will then bear against some ratchet teeth, the upper end of this bolt will run over these special teeth as the lamp is screwed in, but the bolt will effectually prevent the lamp from being unscrewed and taken apart until the bolt has been withdrawn in the manner previously described, but the light will have been meanwhile extinguished before the upper and lower portions of the lamp can be separated, and therefore all danger from any exposure of a naked flame is absolutely impossible.

The improved light is obtained by a strong and powerful lens glass, securely fixed in a metal frame in front, and a silver-plated reflector at the back of the light, thus producing many times the amount of light for the same quantity of oil consumed in the old Davy lamps; and the perfect security by an apparatus which puts out the light coincidentally with any attempt of the miner to open his lamp; indeed, the extinguishing device is positively made to operate by that self-same perfidious act.

On the introduction of the Mines Regulation Bill into the House of Commons on the 23rd February, 1871, Mr. Mundella reminded the house that of the 330,000 miners in Great Britain 1,100 were killed, on the average, in a year, and 10,000 injured; and of this last number 5,000 were permanently crippled.

The safety-lamp now in general use, in consequence of the light having to struggle through the close wire-gauze, does little beyond making darkness visible, which is very gloomy and depressing; and, as it undeniably does not give sufficient light to the miner to enable him to do his work properly, he is often tempted (of course at the hazard of an explosion, frequently fatal to life, and always destructive to property) to open his lamp, and thus to expose the naked flame.

Yates' Improved Safety Lamp gives a cheerful light—estimated at twenty times that of the old "Davy," and sufficient for all necessary purposes, and therefore this temptation to expose the light is removed. Colliers are, however, so accustomed to danger that they grow reckless and despise it; and frequently, for the transient indulgence of a smoke of a pipe of tobacco, will run the risk not only of their own lives, but also of those of their fellow workmen, and of damage to their employers' property. All this is now capable of being guarded against and prevented, as the act of withdrawing the unlocking bolt concurrently actuates the extinguishing device in this lamp, and effectually hinders them from getting at the wick so as to expose the naked flame; it also serves as a tell-tale to indicate that the miner has been disobeying regulations by attempting to open his lamp.

Now that reliable mechanically-extinguished lamps can be obtained, it is to be hoped that very stringent rules will be enacted by the Legislature to make it imperative on all mine-owners to adopt them, and that a very severe punishment will be inflicted on all colliers risking their own and other lives, and the mines-owners' property, by exposing naked lights.

Happily, the advantages are offered with the additional inducement of a considerable economy, as these lamps (paradoxical as it may appear) afford many times the light of the old "Davy" with a decreased consumption of oil, equal to a saving of 50 per cent., or one-half—say 1½ gallons of oil per annum, or in money value about 6s. a year, on every Yates' lamp in use; so that the saving in oil in one year would about pay for the outlay incurred in the alteration of each present inefficient "Davy," lamp into this more perfect and improved lamp; thus giving, cost free, to the mining community all the other advantages of Yates' lamp above described—benefits which, it is trusted, they will rightly esteem, and testify their appreciation of, by universally adopting this lamp.

Cost of a Yates' lamp per week:—

Wear and tear, say	1d.
Oil consumed per annum—three gallons at 4s. equal 12s., or 1s. per month	3d.
Cost of light per week	4d.

Or two-thirds of a penny (a half-penny and a fraction a day.)

The cost of candles per diem is about 1d.; or 6d. per week.

The foregoing calculation is especially commended to the notice of members of the Legislature, Government Inspectors, Coroners, also to mine owners, managers' "Butties," "Doggies," and underground bailiffs of collieries in districts where candles (necessarily naked lights) are still permitted to be used in the pits, as it shows that even the poor apology of a petty saving in the working expenses—too frequently a false economy—no longer remains as an excuse, much less a justification, for endangering the valuable lives of the colliers, often the bread-winners for large families; and it is thought that this view of the matter should interest the clergymen and overseers of parishes in which mines are still worked with exposed lights.

PRODUCTS OF AN AUSTRALIAN MINE.—We learn (says the *Athenæum*) from the *Wallaroo Times* of December 4th (South Australia), that the proprietors of the Moonta copper-mine have prepared a very remarkable collection of specimens for our next International Exhibition, consisting of purple ore, black oxide of copper, and ruby ore, together with "marvellously beautiful" examples of native copper. The same journal prints a letter from Mr. Andrew Hume, who, it will be remembered, was despatched in search of Leichardt's papers, of which he stated he knew nothing. This letter is dated from Lawson Creek, Newcastle Lake, August 15th, 1872.

ON CYLINDRICAL OR COLUMNAR FOUNDATIONS IN CONCRETE, BRICKWORK AND STONEWORK.

By Mr. John Milroy, Assoc. Inst. C.E.

In this communication to the Institution of Civil Engineers, a description was given of an attempt which has been made by the author, acting partly in concert with Mr. J. W. Butler, Assoc. Inst. C.E., to render concrete, brick and stone, more easily available for cylindrical foundations. After alluding to brick cylinders, which had been in use in India for centuries, and had more than once been suggested for home works, it was remarked that probably the engineers for the trustees of the Clyde navigation had been the first to adopt them in connection with a great and important undertaking. In 1869, the trustees requested Mr. J. F. Bateman, M. Inst. C.E., and Mr. J. Deas, M. Inst. C.E., to report on the best means for providing a large and progressive extension of quayage, suited to the present and future requirements of the harbour of Glasgow. With a view to obtain a greater depth of water than could be had alongside the existing quays, their attention was directed to iron cylinders, and subsequently to brick cylinders. The result was that, in 1870, an arrangement was made with the author, in conjunction with the late Mr. Brassey, Assoc. Inst. C.E., to construct in brick cylinders, to some extent as an experimental work, the Plantation Quay, an extension westward of the wharves on the south side of the Clyde. After a brief introductory description of this work, the author confined his remarks to a novel manner of making the brick cylinders, to the mode of sinking them, to the form of the shoe, and to the general arrangements adopted in the execution of the work.

The Plantation Quay was founded on a hundred brick cylinders, sunk in a continuous line close together, so as to form a length of 400 yards of quay. The wells were 12 ft. in external diameter, and 2 ft. 4 in. thick, thus having an internal diameter of 7 ft. 4 in. Their shape was circular, except at the points of contact, where they were formed with tongue and groove, *i.e.*, a square projection fitting into and sliding in a corresponding recess in the adjoining well. From the bottom of a trench, which was cut down nearly to the level of low water, the cylinders were sunk about 36 ft.; but the earth on the river side was removed when the sinking was completed, and dredged to a depth of 20 ft. below low-water level, thus leaving a length of about 14 ft. of cylinder beneath the dredged bed of the river. The cylinders were only carried up 2 ft. above low-water mark; a plug of concrete was then lowered to the bottom of each cylinder, to give it a proper bearing, and to protect the rest of the filling from disturbing influences, when the cylinders were refilled with the sand and other materials which had been excavated. On this foundation, suitably prepared, the rest of the quay was built as an ordinary retaining wall.

The shoe originally specified was that common in India—a flat annular plate projecting downwards from the plate, with outer and inner iron shells which met, and enclosed a circular wedge-shaped space. As this shoe was expensive, the author devised a shoe consisting of a short length of iron cylinder, about 4 ft. 6 in. deep, surmounted by an annular plate, which was also supported by radial brackets. The annular plate was about 18 in. in breadth; and the bottom courses of brickwork, which were bolted to the plate, were corbelled until the full breadth of the wall was attained. Instead of constructing the cylinders brick by brick, *in situ*, as was the custom in India, the author resolved, with a view to the expeditious execution of the work, to pursue the novel course of making them in rings, in frames placed on a platform near the line of the quay, and then to put them together, *in situ*, after they had been allowed to consolidate. Close to the line of the cylinders, over which was erected a high gauntry, with a steam traveller, a wooded platform was laid with a low gauntry, carrying a steam traveller. On this platform the rings were moulded in frames, which were constructed of wood in four sections bolted together. Annular layers of wood were fixed to the platform, in such a way that their outer edges might keep the frames in place, while their inner edges served as guides in shaping the eye of the rings. When a ring had been built up with bricks and Portland cement and had partially set, the frame was removed, and the ring, which weighed between 9 and 10 tons, was allowed to stand a few days to consolidate thoroughly. When the ring had become thoroughly indurated, it could be removed by means of the travellers and a line of rails, either to be fixed in place or to be stored up for future use.

The sinking of a cylinder thus constructed was effected by means of the Milroy Excavator, a description of which had already been read before the institution. The ground through which the cylinders were sunk consisted principally of sand, but the first three cylinders were impeded by old piles and tie-rods; about a dozen cylinders in the centre of the line encountered a bed of rotten sandstone, from 2 to 7 ft. thick, and a nest of boulders, which were frequently met with throughout, had to be brought up in sinking the last ten cylinders. The whole of the one hundred cylinders were sunk between the months of August, 1870, and January, 1872, but from that period a large deduction should be made for those occasions on which the sinking was wholly or partially suspended.

The causes already referred to, and the unavoidable jamming of the cylinders, rendered very heavy weighting necessary. A load of 7 cwt. per superficial foot of frictional surface was required; and to provide for this load, 900 tons of cast-iron weights were kept on the ground. The weights were circular, of the same diameter as the wells, 5 in. thick, and each weighed about 5 tons. A heavy load could thus be piled up in a small space, and at the same time there was no risk of the load tilting the cylinder by unequal distribution, as was often the case when rails or pig iron were used. In sinking the last few feet the usual load was sixty-two iron rings, or 310 tons, which with the weight of the shoe and brickwork (120 tons), made 430 tons as the load necessary to overcome friction.

Such was the system pursued by the author in making and sinking the cylinders of the Plantation Quay. The use of frames in the manner described was found to secure straightness and uniformity of size, a reduction of the external friction by a smooth surface, and an avoidance of confusion in the line of the cylinders. The chief advantage, however, was in the decided increase in the rate at which such a work as a quay wall could be executed.

In practical construction, concrete differed from brick cylinders only in this, that they must be made in frames or moulds, and that an internal as well as an external frame must be used. In choosing between them, the question was chiefly one of expense. When their relative cost was equal, concrete was perhaps to be preferred, as the process of mixing the concrete and filling the frame was so simple, that it could be carried on, under proper surveillance, with unskilled labour. In this connection, mention might be made of the application by Mr. J. W. Butler of Mr. Ransome's artificial stone "apœnite," on the same system as that employed by the author. Having conceived the idea that it was admirably adapted for the construction of cylinders, he made and sank, in 1871, at the Hermitage Wharf, on the Thames, some experimental cylinders with complete success. They were 8 ft. in diameter, and 9 in. thick. The courses or rings were moulded in frames, and were cemented together with the mixture of which they were composed.

From such illustrations, it was evident that by the use of frames or moulds, not only might the old form of brick well be constructed more quickly and satisfactorily, and concrete and other materials be made available for cylindrical foundations, but every variety of form might be produced, suited to every variety of construction and of situation. Without pausing on the different modifications, the author drew attention to a further extension of the system, suggested by the difficulty experienced in sinking loose cylinders in lines or groups. The difficulty was to a great extent overcome. 1st.—By forming combinations of cylinders, incorporated with or moulded into each other, and sinking them together; and, 2ndly.—By so shaping them a number of combinations could, if necessary, be tied into each other in a simple and efficient manner after they were sunk. The most satisfactory way in which a combination might be produced was by incorporating two, three, or more cylinders, so that their contours overlapped each other; and the combinations might be simply interlocked by producing at the points of contact a space or hole, which could be excavated and filled with concrete. Illustrations of such arrangements for the foundations of quay walls were given and explained.

In conclusion, the author directed attention to the advantages which non-metallic cylinders possessed in comparison with iron. The principal one alluded to was that the first expense at present prices was much in their favour with this important difference; an iron cylinder was after all nothing but a skin to which a weight-bearing body or lining must be given; whereas brick and concrete wells were themselves capable of sustaining considerable pressure. In short, iron cylinders, besides being dearer, must, when sunk, receive at least a lining, which it was evident could itself be sunk without the costly addition of the metallic skin.

Death of Captain Maury.—We regret to announce the death of the distinguished American hydrographer, Captain Maury, which is reported to have taken place at Lexington, in the State of Virginia. Perhaps the scientific reputation of Captain Maury stands as high as that of any American of the present generation. Certainly, his "Physical Geography of the Sea" may be said to have initiated a new era in hydrographic science, and the "Challenger" expedition may fairly be deemed a direct consequence of his labours.

Fossil Quadrumana.—Scientific men are interested just now by Professor Marsh's discovery of fossil quadrumana in the eocene deposits of the Rocky Mountains, thus carrying animal life back to a very remote geological epoch. This discovery reminds me of a story current in clerical circles. Professor Huxley had been delivering a lecture at Sion House, and had pointed out that certain geological phenomena, which he explained, involved the existence of the earth for many hundreds of thousands of years. Of course, the majority of his reverend hearers were quite willing to give the Professor any number of ciphers he wanted; but there was one divine who still believed that the world was made in six astronomical days of twenty-four hours each, and he being moved to speak, declared that the geological phenomena in question did not at all perplex him. He had not the smallest doubt that after the Creator had finished His work, the devil had deliberately, and with malice aforethought, introduced all these marks and relics of antiquity in order to deceive. He did not say how it was that the devil had been permitted to do this. That would have opened too large a theological question. It is satisfactory to know that the cleric who thus had the courage to avow his convictions received his reward.—*Antiquary.*

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SIR ANTONIO BRADY.

NOTICES.

Thursday, March 13th, at Eight o'clock p.m., adjourned general meeting on the "Patent Laws."

Thursday, March 27th, at Eight o'clock p.m. "On the Construction of Steamers for the Channel Passage, and especially the Sedley-Dicey Construction." By A. J. Sedley, Esq., Memb. Council I. I.

Monthly Notices.

Technical Education—Tribunals of Commerce: the Lord Mayor, the City Companies, H.R.H. the Duke of Edinburgh, and the Committee of London Liverymen—Special Committee of Inventors' Institute on Patent Law Reform—Sleeping Carriages on Railways—Death of Professor Sedgwick—Removal of the Natural History Collection at Kew to South Kensington—Establishment of the Manufacture of Dynamite in Scotland—Utilisation of Slags in Germany—Sulphur in Iceland—Substitute for Coal Gas—Improvements in the Manufacture of Caustic Soda—The Physometer—Production of Metaliic Manganese—Discovery of Graptolites.

Signs of new life seem exhibited in the world of Science, especially as regards Industrial Science. The movement in behalf of Technical Education is progressing satisfactorily, as is also that in favour of Tribunals of Commerce, which has the advantage of the energetic exertions of our friend, Mr. J. R. Taylor, who read a paper before the Inventors' Institute, on February 13th, on this subject, as connected with patent cases, and we are glad to inform our readers that the Lord Mayor has agreed to call a public meeting in the City for the discussion of this important matter. As regards the utilisation of the City Companies for the promotion of Technical Education, we have to mention that that matter has once again been brought before the public by Mr. Campin, Mr. G. Saywell, and Dr. Yeats, and has been favourably entertained by the Committee of Liverymen of London. H.R.H. the Duke of Edinburgh, who has just been made a member of the Coachmakers' Company, has expressed his approbation of this movement. We are informed that the special committee appointed by the Inventors' Institute to report on the recommendations of the House of Commons Committee on the Patent Laws, have held several meetings, and will shortly have prepared their report for presentation to the Council of the Institute.

The progress of civilization as regards railway transit is continuing; sleeping carriages are now provided on some of the railway lines.

We have to make the sorrowful announcement of the death of Professor Sedgwick, of Cambridge—a fact of melancholy interest to all geologists and men of science.

It appears that the Government, in answer to a memorial signed by many of our leading botanists, soliciting that the collection of dried plants, library, &c., be not removed from Kew to the proposed Natural History Museum at South Kensington, have signified that there is no intention to effect such a removal, although recommended by the First Commissioner of Works; and the Government promises that, if at any future time such a step should be thought desirable, ample opportunity for consideration of the subject by scientific men shall be afforded.

Extensive works for the manufacture of dynamite have been erected near Stevenston, in Scotland, said to be the first established in this country. They are calculated to be able to produce ten tons of this explosive compound per day.

Slags from iron works have often been sought to be utilised; and perhaps the following process (said to be adopted at Osnabrück, in Germany) is likely to prove a practical success. The molten stream from the tap is allowed to flow into water from a suitable height, in the same way as lead is converted into shot in towers. It is used for filling in between railroad sleepers and the manufacture of concrete, and, when containing considerable alumina, is ground and converted into alum.

The immense stores of sulphur that have long been known to exist in Iceland have recently been proposed to be rendered practically available.

Gas, available for use in the place of coal gas, is proposed to be produced by Mr. Ruck by the decomposition of superheated steam, by bringing it in contact with a mixture of coke and iron at a white heat, thus producing hydrogen with a percentage of anhydride; and, upon this being removed by the action of lime, a heating, though almost non-illuminating, gas is obtained which, upon being passed through a petroleum (specific gravity, 0·68 degrees), the hydrocarbons absorbed render it of illuminating power comparable to that of ordinary coal gas.

Dingler's *Polytechnisches Journal* contains an account of improvements in the manufacture of caustic soda, introduced by Herr Helbig.

A new instrument for determining variations in a given volume of confined air, termed a "Physometer," has been devised by Herr P. Harting, and constructed by W. Olland, of Utrecht.

The *Seientific American* describes a process invented by Mr. Hugo Tamm for producing metallic manganese on a large scale. The process is represented to be an economical and ready one, the fluxes employed being ground glass and fluor spar.

Professor A. H. Nicholson, of Toronto, has been making fresh discoveries of graptolites in the shales of the Quebec group of Point Levis, Quebec.

The Inventors' Institute.

At the meeting on Thursday, the 30th of January, the paper read was on " The Bursting of Pipes from the Effects of Frost." By J. A. Calantarients, Esq.

The chair was taken by F. H. Varley, Esq., Member of the Council.

Mr. Calantarients first succinctly referred to the history of the methods of water supply, and then proceeded as follows, occasionally adverting to the various diagrams herein referred to, which were exhibited on the walls of the room :—

It is difficult to classify the different kinds of pipes in the order of their introduction, and almost impossible to assign them dates. As far as I can make out the order seems to be as follows :—Stone or marble, wood, lead, iron, cast and wrought, glazed earthenware and sheet iron, the last of which was introduced in the 18th century.

I cannot help thinking, however, that wooden pipes must have been used first, and long before stone or marble ones were thought of, for the naturally hollow trunks of trees must have been the first to suggest the idea of making pipes, and wood is certainly the easiest to work. Marble tubes are first mentioned, because the works in which they were first used were great undertakings, where durability and strength were of paramount importance.

At the present day many different kinds of pipes are made for the conveyance of water, but those most generally used are iron pipes of large and small diameters, and lead or composition pipes of small diameter. It scarcely falls within the province of my paper to discuss the comparative merits of different kinds of pipes ; so far as my object is concerned they are all equally fragile, and my invention is equally applicable to all the varieties of them.

As you are aware, water at the moment of congelation into ice increases about a twelfth of its bulk, and expands so forcibly as to burst the vessel in which it is contained. Indeed, to speak on the authority of Professor Miller, this expansion force is so enormous, that no vessels have been found sufficiently strong to resist it. Water, the most widely diffused, the most important, and withal the most harmless of all substances on earth, seems as if it could not pass into either of its allotropic conditions without making its effects powerfully felt by the external world. In one form, passing through the bowels of the earth, it produces earthquakes and volcanic eruptions, and in a minor degree through the steam engine it does the Herculean labours of the world. In another form, by percolating through the narrowest crevices of the hardest rocks, it bursts and disintegrates them.

Who can calculate the almost incredible amount of mechanical work exerted in the pulverization of the original plutonic rocks of the earth, and their conversion into the state in which we find them ? Yet the expansive force of ice has been the chief agent in bringing about this result. I believe it may safely be asserted that this peculiarity of ice has done more for the benefit of the earth, in the way of preparing food for its vegetation, than steam has ever done in any way (of course, I mean with regard to its natural operations).

Beneficial though this property of ice has been, and is, in the general economy of nature, yet in one particular instance, which concerns us most, it proves prejudicial—for it entails an incalculable amount of mischief, by also bursting our pipes and vessels, which the requirements of civilization, indeed those of real comfort, have made necessary that we should have in the very midst of our homes.

What power is there in nature which does not work for, or against us, according to our capability of guiding it ? Lightning, for instance, would strike our noblest buildings and shatter the stoutest masts, were it not that by a simple strip of metal we gently lead its terrific force away into the earth, and take advantage of its subtle power to almost annihilate time and space.

Steam again, as generated in a steam engine, would burst its boiler and destroy everybody and everything in its vicinity, were it not that by means of the safety valve we avoid that danger, and yet compel its power to administer to our wants.

We should scorn the idea of making buildings strong enough, or masts stout enough, simply for the sake of resisting the destructive action of lightning; or steam boilers thick enough to resist any amount of tension which steam is capable of exerting ; yet this is the actual practice at the present day with regard to our water pipes. We build a house, furnish and decorate it gorgeously, take care that it is dry, warm, and comfortable, and, above all things, that it has every appliance for a due supply of water ; but what security have we that these pipes will not burst any night in winter, and deluge the house on which we had expended so much care and money ? No one would for a moment maintain that the thickness of the pipes is any security, and any other, we have none. As the lightning conductor to a tall monument, and as the safety valve to a steam engine, so I offer my invention as a rational and simple means of diverting from water-pipes a destructive force.

It is high time, indeed, that such an invention was made; for it is 300 years (all but 10 years) since water pipes began to be laid in houses, and the nuisance of pipe bursting has continued to annoy householders up to the present day. I can find no account whatever of the means resorted to in former times to prevent the bursting of pipes. At the present day, as far as I can gather, they consist simply in contrivances for the prevention of the freezing of the water, such as packing the pipes with straw, flannel, felt, or cases of saw-dust. These would answer only if the temperature did not fall much below freezing point, and especially that the frost did not last long ; if the frost lasted any length of time they would be utterly useless, for they are simply palliative means ; another method is to turn the water off at the main stop tap and empty the pipes every evening when it is likely to freeze ; this, no doubt, would be effectual, for there being no water in the pipes it cannot freeze ; but how can we depend upon this precaution being always observed. If it is neglected but for one frosty night, all the trouble previously taken is thrown away, and the pipes will burst notwithstanding. It is well-known that whatever depends upon constant vigilance is sure to miscarry some day or other, to say nothing of the carelessness of servants whose duty it will be to do it ; besides, can we always tell when it is going to burst ?—it may happen when we least expect it. This is really analagous to entrusting an engine-boiler, without a safety valve or pressure guage, to a man, and asking him to be on the watch, and turn out all the fire from the furnace whenever he thought the boiler was going to burst. We do not want to be always thinking about our water pipes. What we want is a thoroughly reliable self-acting contrivance, which, once applied, may completely free us from all anxiety.

Having shown that it is a great desideratum of the day to have some effectual means of preventing the bursting of pipes, and that no such means have hitherto existed, I will now proceed to describe to you my invention.

In doing this, for the sake of clearness, I shall confine myself to water in its relation to water pipes, as at present used for supplying houses with water. The principle of the invention being thus clearly explained in one instance, its application to other similar purposes would be easily understood.

As I have already mentioned, water in passing from the fluid to the solid condition of ice expands a twelfth of its bulk, as the force exerted during such expansion is practically irresistible. I propose by my invention to oppose to it not a resisting, but a yielding medium, so that it may give way with ease, and make room for the increased volume of the ice, and by so doing completely divert all injurious tension from the pipes.

The invention, then, in its simplest form, is this. I pass through the service pipes of a house a flexible air and water-tight tube ; this tube is one-tenth the capacity or area of the water pipe, and is of sufficient strength to resist being compressed by the mere weight or pressure of the water ; one or both the ends of this tube are brought out of the water pipe and fixed to it by means of a short piece of metallic pipe, so that the air within the air-tube communicates with the atmosphere.

Having thus a column of air running throughout all the water pipes, and of a volume equal to more than the difference between that of water and ice when a frost comes, the ice, as it forms, gradually compresses the air tube and takes its place—the air tube thus acting as a safety valve completely diverts all tension from the water pipes. As soon as the ice melts, the air tube, by its own resiliancy, reassumes its former shape, and is ready to be acted on again and again by repeated frosts for an indefinite number of years without once requiring human interference. This is really my invention in its simplicity, and in this form it is applicable to all localities where there is no great water pressure.

But where there is great water pressure, and it is not convenient to use too strong an air-tube, I use the forms No. 2 and 3. The only peculiarity of these is, that there is an air reservoir attached to the air-tube, and the ends of the air-tube are closed. The purpose of the air-reservoir is to afford a space into which the air from the air-tubes might escape into where they are compressed by ice.

In No. 2 (as in No. 1) an air-tube is adopted, closed at all its other ends, but opening into an air-tight air-reservoir—the resisting power to compression of my air-tube being known. If the pressure of water (as measured by a pressure guage) at the lowest point of the water pipe happens to be greater than the resisting power of the air-tube, air is pumped into the air-tube and reservoir, until there is sufficient tension produced in the air-tube to counterbalance the pressure of water surrounding it at its lowest point, and the air-tube is kept open. When the water in the pipe freezes, it forces the air from the air-tube into the air-reservoir and takes its place. When the ice melts the air, by its own elasticity, (assisted by the resiliancy of the air-tube) returns again to its former position and distends the air-tube, which thus becomes ready to be acted on again.

In No. 3, the service pipe is provided with an air-tube, closed at all its other ends, but opening into the air-reservoir at a given point. The mode of action here is just similar to that in No. 1 and 2, only that in this form I can make use of much weaker tubing, and the water itself is made to produce the required tension in the air-tube by allowing it to flow freely into the bottom of the air-reservoir. The air-reservoir is attached to the water-pipe somewhere about its lowest point. Its size would be determined by the length and capacity of the air-tubing in communication with it, and by the degree of water pressure in the given locality—but a few sizes can be made to apply to all houses—assuming that it is just fitted up, and both the water pipes and the air-tubes, and reservoir are full of air. As soon as the water is turned on it rushes into the air-reservoir as well as into the water-pipes. When the water-pipes are completely full, the water in the air-reservoirs will stand at such a point as that the air above it will have a tension equal to the pressure of the water—but, as the air-tube is in communication with this air, the same tension would be imparted to the air in the air-tube, and this, therefore, will remain open (assisted, also, by its own resiliancy of course). The beauty of this arrangement is that it is entirely self-acting; it enables one to dispense with even the trifling amount of trouble involved in pumping the air in, and, above all, that the tension of air in the air-tube is kept always equal to the pressure of water surrounding it at its lowest point, however much this pressure might vary.

In this case the strength of the air-tubing would be entirely determined by the height of the house, without reference to the degree of water pressure. For instance, in a house 60 ft. high, with a water-pressure of 100lbs., or any number of pounds to the square inch, my air-tube need only have sufficient strength safely to resist a tension of 30lbs. to the square inch, equal to the pressure of water 60 ft. high (roughly speaking), for the remaining water pressure of 70lbs. to the square inch is met and neutralised by an equal amount of tension in the air-tube, which tension is produced by itself. The air-reservoir will, of course, be placed in a well-protected corner of the house, so that it may not freeze; but even if it did, no harm would result, for the piece of air-tube passing through it is metallic, and cannot become compressed and impede the free communication of air. If any part of the water pipe freezes the action would be exactly similar to that in No. 2. In No. 3 the stop tap can have an arrangement by which the continuation of the air-tube might be kept up when a tap intervenes, or when it is desired to connect two different systems of air-tubes together. Here a metallic tube bent twice at right angles, the ends joined to the air-tubes on each side of, and close to, the tap, inserted into the water pipe, and soldered or otherwise secured to it.

For water pipes of large diameter, such as those used for heating churches, schools, and other public buildings, I would use large-sized air-tubes enclosed in the water-pipes without any communication with the atmosphere, or any reservoir; for a large volume of air being already enclosed in them, the air would easily get compressed into a smaller volume by frost, quite sufficient to relieve the pipes of their tension. Indeed, the same thing might safely be done with the small pipes of a house; for all these pipes never freeze throughout, and the air from one part can easily get compressed into the other parts of the air-tube, and so relieve the water pipes. In No. 5 I have shown an arrangement which will be very useful for water-closets and other similar purposes, and can be applied to them quite independently of the general system of water-pipes in a house. The water pipe which conveys the water from the cistern to the pan of the water-closet. The air-tube begins in a bell-shaped expansion at a given point (which may be placed somewhere under the seat), and ending at a little above the water-level of the cistern; the parts of the air-tube outside the water pipe and its rails in the cistern are metallic. A tap supplies the cistern with water, and the air-tube makes a turn round this before ending. The air-tube will, of course, prevent its bursting by frost, and the cistern, being open at the top, can sustain no damage. But, as great inconvenience is caused by the water-closet becoming inactive during a frost, by suitably applying a light, such as a lamp, warm air might be sent through the air-tube, the ice melted, and the water-closet made serviceable in a short time. If desired, the heat may be kept up so long as the frost lasts, which may be done at a nominal cost, and thus a great inconvenience removed.

The same means, with some modification, might be applied to the general system of water pipes in a house, and thus their freezing prevented, or if frozen, the ice melted, and an uninterrupted supply of water kept up during the severest frosts.

In No. 6 I have shown how the explosion of kitchen boilers might be avoided Here, the air-tubes being of large size, there is no need of a reservoir. Besides, the portions of air-tube in the boiler, and in the water-tank being metallic, would act as such. The parts that do get frozen are portions of flow and return pipes, and as the air-tube passes through them, they cannot burst; but the air-tube vessel is of larger capacity than required for the expansion of ice alone, so that even if all the pipes were frozen there would still be space left throughout the air-tube, and this thoroughfare would be capable of further compression.

Assuming that all the pipes are frozen and a fire is lit, whilst the water in the boiler is getting heated, the air in the air-tube is also getting heated; and as there is a space throughout it, a circulation of warm air would soon become established. If the fire is not too great, the circulation of warm air would soon melt the ice and establish the circulation of water. But, if the fire is great, and the water gets heated and expands too rapidly, then it would compress the air-tube further, and make its way through the space thus gained; melt the ice rapidly, and establish the circulation—indeed, those two processes would almost go together, and so make the explosion of kitchen boilers an impossibility. If preferred, the supply pipe alone may he fitted with the air-tube, which would merely answer the same purpose.

Having now described a few applications of my invention, I will briefly enumerate some of the advantages which would result from its adoption.

1. An actual saving of money; for, at a comparatively trifling initial cost, a house can be made perfectly secure against all possibility of its pipes bursting. As every householder probably knows, the bursting of a pipe does not merely mean a plumber's bill, but an amount of damage is often done to the house with its paper, carpets, furniture, and other valuables, that disfigures the house, and entails great expense; and yet, when all repairs are done, there is not the slightest security that the same infliction will not soon be repeated.

2. Saving of a great deal of worry and annoyance in consequence of pipes bursting, which not infrequently takes place in the middle of the night, and produces more discomfort even than the actual expense entailed.

3. The prevention of all possibility of sewage matter finding its way into drinking water. If a ground pipe happens to become leaky by frost, and sewage matter finds its way to it, there is nothing whatever to prevent the contaminated water being mixed with drinking water, in the event of the pressure in the main being removed, though only for a moment.

4. The rendering of water-closets serviceable during frost at a nominal cost.

5. The complete prevention of kitchen boiler explosions.

6. Saving of water. There is often a great deal of water wasted through long-continued leakage and bursting of pipes.

7. Its easy applicability to all the existing houses, churches, schools, &c., without, in the slightest degree, disturbing the arrangements of the house.

8. Possible saving of metal in the manufacture of the water-pipes, for they now need not be made thicker than actually required to stand the pressure of water.

9. The last, and not least, advantage is, that it being entirely self-acting, requiring no constant watching, and no amount of carelessness from servants would affect it.

The reading of this paper being concluded, the Chairman invited discussion upon it, specially requested Mr. Whitehouse, C.E., and to make some remarks upon it, who said it was a subject he did not feel himself in a position to discuss.

Mr. Frederick Ransome, C.E., memb. of Council, said he thought a flexible air tube a good thing for effecting the object proposed by the author of the paper if such a tube could be introduced and maintained in position, but although there might be some difficulties attending the application of this invention, such as the small calibre of many of the supply pipes now used, and the high service arrangements as adopted in many first-class houses, still there was considerable merit in the proposed plan.

Mr. A. J. Murray said that whatever objections might have to be dealt with in order to successfully apply this invention, it was perfectly clear that such a system, if it could be practically carried out, would effect a great public benefit.

Mr. Payne, as a practical man, considered that in the case of a house 60 or 70 feet high, the pressure of water would be detrimental to the applicatlon of the invention, as constant vigilance would have to be exercised to keep the pipe safe; but he presumed the inventor was prepared to meet this difficulty.

Mr. Ed. Hall, as an architect, could testify to the exceeding importance of preventing the bursting of water pipes in houses, for the inconvenience and mischief was so great and repulsive that housekeepers would gladly undergo a good deal of trouble, and spend much money, to avoid being subject to them. Although objections had been started to this invention, he had failed to see what part of the contrivance proposed was bad. He assumed that the inventor must have made provision against the action of a column of water in high houses, and the other circumstances which would affect the utility of his invention.

Mr. Edson and Mr. Hardy made some remarks on the difficulties of applying india-rubber air-tubes, and keeping them distended, notwithstanding the pressure of the column of water contained in the pipes; and Mr. Geo. Clark remarked that the real question seemed to him to be whether flexible tubes of india-rubber were reliable, for he had great doubts as to their durability when applied as proposed; he gave the author of the paper the credit of exceeding ingenuity, and trusted that notwithstanding anything that had been said that evening he would persevere in his laudable object.

Mr. Ed. Hall then mentioned that in the case of Jennings' water-closets india-rubber tubing had been found satisfactory, and he did not see why it should not be found so in this case.

After some remarks by Mr. Maccomber, Mr. Carttar, and Mr. Yates, the Chairman summed up by pointing out the *pros* and *cons*, when

Dr. Calantarients replied by stating that the results of his experiments were favourahle to the practicability of his invention, and he felt every confidence that he would be able to make it a practical success. The various points pressed upon his notice that evening were, he admitted, of a most important kind, but he was not afraid of them, and felt that he should be successful in overcoming them. He thanked the meeting for having received him with so much interest and attention.

A vote of thanks having been unanimously accorded to Dr. Calantarients, also a vote of thanks to the Chairman, the meeting separated.

At the meeting on Feb. 13, 1873, Mr. C. G. Carttar, Memb. of Council in the Chair, Mr. J. R. Taylor read a paper on "Tribunals of Commerce as available for Patent Adjudications," in which after soliciting indulgence for any shortcomings that might be found in his paper, from the preparation of which his attention had been much drawn away by the recent fatal illness and death of

Mr. George Dornbusch, a principal supporter of the Tribunals of Commerce movement, and after having made some remarks on the state of that movement, continued:—"Whether the Tribunals of Commerce to be established should embrace Patent Adjudications is a very proper theme for the Inventor's Institute to consider. It has been thought by Mr. Campin and Mr. Latham, two gentlemen whom I now see before me, and they are both competent to judge, not only as barristers, but scientific men, that patent adjudications, and the 'non-legal element' principle, can be embraced in any good Tribunal of Commerce Bill. Whether such a Bill is brought in by the City of London, Mr. Whitwell, the hon. Member for Kendal, on behalf of the associated Chambers of Commerce, or by the Government, as a public Bill, is but of little consequence so long as the principle is preserved. All present will agree with me, whether such a Bill embraces the "patentee's safety valve," cheap and efficient patent adjudication, or any other branch of British jurisprudence, that this great and much-needed reform cannot be much longer deferred, the country being now ripe for its accomplishment—the cry being for "speed," combined with "economy," in all that relates to patent rights, and the general jurisprudence of the country.

As to the delays in suits for the infringement of patent rights, or in the trial for the validity of patents at common law, perhaps but few here have had the opportunity of knowing so much of these evils as myself, having had as many as 1,000 solicitors' accounts on my books, embracing thousands of suits and actions, not only on the infringement of patent right but of copyright, and every other class of business. I have seen the poor inventor, the man of skill and science, who has burnt the midnight oil in order to perfect his invention, so chilled by the cold blasts of poverty and an ungrateful world, that he has sunk into oblivion, whilst the mere man of money has carried off the prize. I have seen this in all the various stages of the law, from the filing of the bill in Chancery to the final appeal to the House of Lords. The tormenting anxiety of mind of the poor litigant in his approach to the avenue of justice no one can fully pourtray, except the man who is compelled to undergo the painful ordeal. I have often felt ashamed, as an Englishman in this free country, to witness such a mockery of justice. I could mention, as I have already said, innumerable cases where poor litigants have been obliged to stay proceedings through lack of means, and of those who dared not venture to approach the gilded tribunal of the House of Lords. So much for law and justice being open to the poorest litigant in this country. I remember one patent case amongst hundreds of other cases, that of "Muntz *v.* Foster," which was the fruitful parent of many others, wherein the late M.P. for Birmingham, George Frederick Muntz, figured as the plaintiff, he being the patentee of the yellow metal sheathing for the bottom of ships, wherein as many as six counsel were engaged with briefs for each counsel, running from 200 to 250 brief sheets each. You may judge of the magnitude of the interests involved when I tell you that the patentee realised from his patent £1,000 a week. These are the sort of causes on which lawyers thrive, and are enabled to realise large fortunes, and the counsel are enabled to climb up to the lofty eminences which many of them now occupy in the high places of the land. The eminent solicitor has been pre-eminent for his heavy bill of costs, and his eminent counsel for counsels' fees, which have enabled him to get into Parliament, as the first step in the ladder of preferment, he very naturally turns a deaf ear to the cry of the poor litigant. He says "of all my father's children I love myself the best," and is charmed with the music of—"There is nothing like a good patent case, bankruptcy, charity, or lunacy case, in our Courts of Law and Equity." Owing to my having been for above ten years engaged for two of the taxing masters of the High Court of Chancery, where every bill of costs to be taxed passed through my hands, I can speak with certainty, from the very ample opportunities I have had of witnessing the practical working of the system, that nearly the whole or very many of the actions and suits I have had to do with, would, if there had been proper tribunals of commerce established, soon have been brought to a speedy, satisfactory, and economical settlement.

Why, then, should not Tribunals of Commerce be established in this country? Because the interested practitioner says they will never suit the free soil of England. Why not suit England as well as France, Belgium, the provinces of the Rhine, Denmark, and other places abroad? In Denmark out of 10,000 cases in dispute taken before the Reconciler 8,500 were actually reconciled, and 1,500 were sent from the Reconcilers' Court to the Arbitrators' Court, and from this latter court only 500 cases found their way to the Tribunal of Commerce. In this tribunal seven merchant judges sat in judgment; they were men as well versed in trade usages and customs as the Chairman of the Council of the Inventors' Institute, or the most practical men of business to be found in this country. They were men fitted by education in commercial life to judge of these 500 cases, and to give an intelligent and impartial judgment on the question at issue. The majority of these seven judges give their vetoes and reasons, with as much of solemnity and precision as their lordships in appeal cases in the House of Lords, and thus settled their verdict, and it appears that out of the whole of these 10,000 cases in Denmark, only 50 cases on the question of law found their way by appeal to the superior law courts. It should be borne in mind that before an appeal could be allowed the party appealing had to give security for the costs of such appeals, and that one of the chief reasons for so many cases having been reconciled arose from the high-souled motive that "no trader liked to stand before his fellows to be called an autocrat, and to be convicted of being fond of litigation."

Of course, lawyers, and those opposed to the Tribunals of Commerce system, will have something to say against them, but, what do others say in their favour? What says Mr. M. Defries, of Houndsditch, in speaking of those established in France. He writes:—"I am quite of opinion that a Tribunal of Commerce for England would be of immense advantage to the trading community. It saves a vast amount of trouble, anxiety, and above all, expense, which a trader in humble circumstances can ill afford to pay, and which, as you are aware, is incurred in the present state of the law." Also, what does Mr. Corr Vander Maeren say, and he is of some authority, as he was for many years one of the Merchant Judges of the Tribunal of Commerce in Brussels, and gave evidence, in 1858, to the Select Committee of the House of Commons. He says:—"I have retired from the Commercial Bench now for many years, but I shall be happy to give you every information in my power. It has always appeared strange to me that in a great commercial nation like England you should have had no Court of *special* commercial objects! although you have special Courts of Divorce, of Bankruptcy (which forms *a branch* of our Tribunal), for Ecclesiastical matters, &c."

No one knows better than Mr. Campin and Mr. Latham, as barristers, that lawyers, as a body, have a proverbial dislike to anything in the shape of financial accounts, and this is, no doubt, shared in by very many of their brethren on the Bench, not excepting even the Judges of her Majesty's Court of Exchequer. There are those present old enough to remember the colossal financial accounts in the once celebrated cause of "Small *v.* Attwood," of British Iron Company notoriety, wherein the law costs in the Court of Common Pleas alone amounted to the enormous sum of £58,000. When that celebrated and long-contested cause came on for hearing, in one of its many phases, before the late Lord Lyndhurst, his lordship, in referring to the above bill of costs, very drily and facetiously remarked "There is nothing like leather." But I am afraid this gratuitous attempt at wit would be but a poor sort of consolation to the broken-down and ruined litigants, and that it would be sorry leather to make boots and shoes from for these unfortunates and their helpless families. Will any one venture to say that such an extravagant outlay as £58,000 for law costs would be at all sanctioned or permitted by any scale of costs if Mercantile Judges were called upon to preside over Tribunals, where such matters had to be determined?

Mr. Taylor added some very able explanations of the general position and bearings of the Tribunal of Commerce question, and showed how such tribunals might be advantageously employed to deal with the affairs of persons in a bankrupt condition, which our present Courts of Bankruptcy seemed as powerless to settle satisfactorily as any that had preceded them. As, however, these explanations and remarks, though worthy of earnest attention, do not concern the express object of the paper, the limitations of our space compel us to refrain from reporting them.

After the paper had been read a discussion ensued, in which the Chairman, Mr. F. W. Campin, and Mr. Latham took part; the tenour and effect of their remarks being that the establishment of Tribunals of Commerce and their adaptation to patent adjudications appeared to be very desirable; it being understood that although there might not be any objection to one of the ordinary merchant judges or adjudicators sitting as a patent adjudicator, yet, the majority of the patent adjudicators must be men of practical and technical knowledge from time to time selected from an ample list or rota; and it was agreed that the whole subject should be brought before the Select Committee of the Institute now sitting.

The Chairman having moved, and Mr. Latham having seconded, a vote of thanks to Mr. Taylor for his able and instructive paper, which was passed unanimously and responded to by that gentleman, the meeting separated.

Preserving Meat by Acetate of Soda.—We published, says the *Scientific American*, in Vol. XXVII., page 149, an account of M. Sace's researches upon the antiseptic properties of acetate of soda, and refer to it again for the purpose of recommending, to the manufacturers of vinegar in the South, the substitution of soda ash for lime in absorbing the products of the distillation of wood. The soda ash may cost considerable more than the lime, but the resulting acetate of soda can be employed to great advantage in the preservation of food, and it would be possible to send the cheap beef of the South, after preservation in the acetate, to a market where it would fetch a high price. Another advantage in the employment of soda is that the crude acetate can be easily refined, and from it the pure glacial acetic acid can be made by treatment with sulphuric acid.

Professor Sedgwick's Successor.—Mr. T. M'Kenna Hughes, M.A., of Trinity College, has been elected Woodwardian Professor of Geology at Cambridge, in succession to the venerable Professor Sedgwick. Originally there were nine candidates, but most of them retired before the poll, and the real contest lay between Mr. Hughes and Mr. Bonney, a Senior Fellow of St John's, the numbers at the close being 112 and 105 respectively. The new Professor is a Fellow of the Royal and the Geological Societies.

Proceedings of Societies.

THE INSTITUTION OF CIVIL ENGINEERS.

At the meeting of this society, held 28th January, 1873, T. Hawksley, Esq., President, in the chair, the paper read was on Cylindrical or Columnar Foundations in Concrete, Brickwork, and Stonework, by Mr. John Milroy, Assoc. Inst. C.E. (This paper will be found on another page of this journal.)

The announcement for the next meeting was as follows:—On Tuesday, February 4th, at 8 p.m., 1° Discussion on "Cylindrical Foundations;" 2° "The Relative Advantages of the 5 ft. 6 in. Gauge, and of the Metre Gauge, for the State Railways of India, particularly for those of the Punjab," by Mr. W. T. Thornton, Secretary of the Public Works Department, India Office.

February 4, 1873. T. Hawksley, Esq., President, in the Chair. The paper read was on "The Relative Advantages of the 5 ft. 6 in. Gauge, and of the Metre Gauge, for the State Railways of India, particularly for those of the Punjab," by Mr. W. T. Thornton, Secretary of the Public Works Department, India Office.

In this communication it was stated that, belief in its superior economy being the one solitary reason why the Indian Government had adopted a narrow gauge for its State Railways, the first thing to be determined was whether this economy was real or imaginary.

Now, the programme of the Indian Government contemplated the construction of 10,000 miles of State Railways. By making them, therefore, on the light metre instead of on the light standard gauge, a saving of ten millions sterling would be effected. To add, then, ten millions to their cost for the sake of avoiding the evils, however great, of break of gauge, was plainly out of the question. Speaking generally, if not made on the narrow gauge, they could not be made at all.

To this general rule, however, there might be exceptions. There might be localities for which, owing to particular circumstances, the broad gauge would be far better adapted, and it was extensively and authoritatively declared that one such locality was the Punjab. The arguments to this effect had been urged with acknowledged force and fairness by Mr. Fowler, and it was to him, as making out the strongest case against the Punjab portion of the Government plan, that the author more immediately replied.

The case stood thus: Continuous railway communication from Peshawur to Kurrachee, a distance of 1,092 miles, being the desideratum; two sections, viz., from Lahore to Mooltan, 214 miles, and from Kotree to Kurrachee, 105 miles, or, together, 319 miles, has already been made on the standard gauge; while two from Peshawur to Lahore, 280 miles, and from Mooltan to Kotree, 493 miles, or, together, 773 miles remained to be constructed. Mr. Fowler, in common with all other objectors, admitted there would be a considerable saving by making these two latter sections on the metre gauge. According to his calculations, the amount of the saving would be £680,000, according to those of Mr. Lee Smith it would £900,000, while by the Engineers of the Indian Government it had quite recently been estimated at £760,000. At the rate of £1,000 a mile, arrived at in the manner indicated in the first paragraph of this summary, it would be £770,000. From Mr. Fowler's figures, however, which were adopted as being the least favourable to the Government, Mr. Fowler made two deductions, one of £327,177 for laying a third rail between Lahore and Mooltan, and for relaying on the metre gauge the present broad gauge rails between Kotree and Kurrachee, thereby reducing the saving to £352,853, and a second of £320,700 for the provision of rolling stock for working through traffic on the (future) metre gauge between Mooltan and Lahore, and for an extra supply of rolling stock between Kurrachee and Peshawur in view of military emergencies, thereby leaving of the originally admitted saving of £680,000, no more than £30,000.

The necessity for the first of these deductions the author did not attempt to gainsay; but, against the second, although believing himself to stand alone in this opinion, he strongly protested. Taking first, the section from Mooltan to Lahore either, he said, the existing quantity of broad gauge rolling stock thereon was sufficient for all expected traffic, whether through or local, or it was not. If it was not, then, in case the broad guage had been adopted for the adjoining sections also, it would have been indispensable to provide additional broad gauge rolling stock for the Mooltan-Lahore section; the cost of which addition would certainly have been at least equal to that of the quantity of metre-gauge stock requisite in order to render the total amount of rolling stock, broad and narrow, capable of conveying all the traffic on a mixed gauge. If, on the other hand, the present quantity of broad-gauge rolling stock were sufficient, then, when supplemented by a quantity of metre-gauge rolling stock for use on a mixed gauge, the total of broad gauge stock would obviously be in excess of the quantity required, to the exact extent to which it had been supplemented by narrow gauge stock; and the difference would be available for sale or transfer to the broad gauge lines, the sale proceeds, or appraised value, serving as a complete set-off against the money spent on the narrow gauge stock.

Similarly, for the Lahore-Peshawur section, the cost of providing rolling stock just sufficient for ordinary traffic would be the same whether the guage were broad or narrow, or the difference, if there were any, would be in favour of the metre gauge; so that, whatever necessity there was for providing additional stock for military contingencies, the necessity would be the same for both gauges, the cost also being the same, or, if anything, less for the narrow gauge. It was thus abundantly clear that, in comparing the cost of the proposed mixed gauge with that of the standard gauge for the entire Punjab system, there was no valid reason for augmenting the former with one penny on account of extra rolling stock; and, the addition made on that account by Mr. Fowler being withdrawn, the saving by the adoption of the mixed gauge remained, as virtually admitted by himself, at £352,823.

The author then proceeded to observe that it was a mistake to suppose that the Punjab Railway system would be complete when, even by the filling up of the gap between Kotree and Mooltan, and by an extension from Lahore to Peshawur, a continuous trunk line should have been formed from the last-named town to the Port of Kurrachee, for these works would speedily have to be followed by the construction of a branch of about 180 miles from Sudkur to Dadur at the mouth of the Bolan Pass, and at no very distant period by a junction line of some 200 miles, connecting the Indus Valley Railways with those of Rajpootana. The aggregate length of these prospective lines could scarcely be less than 400 miles, and as the determination of their gauge would obviously depend upon the one selected for those of the Indus Valley, the choice of the metre gauge instead of the standard for the latter would, taking £1,000 a mile as the difference of cost between the two, occasion a saving of £400,000 upon the prospective lines. Of this additional sum, however, only the £180,000 assignable to the Dadur line was here taken into account; but that much being added to the £352,823, with which the narrow gauge had already been shown to be on Mr. Fowler's principles entitled to be credited in respect of the Punjab, would raise the total saving consequent on its adoption in that quarter to £532,823.

To what extent, then, would such large pecuniary advantage be counterbalanced by the evils consequent on break of gauge? Here it was pointed out that those evils would, so far as import traffic was concerned, be only partially obviated by the adoption of a light standard instead of a light metre gauge, because as the only railway that abutted on the Punjab from the East was laid with rails heavier by one-third than those proposed for the Punjab, even by the advocates of the standard gauge, its proportionably heavier engines could not travel on the Punjab rails without destroying them. Not, however, denying that some evils would be attendant on break of gauge, an endeavour was made to determine its amount. The evil was partly mercantile, *i.e.*, affecting the transport of merchandise—for the inconvenience to private passengers in having to change carriages once in the course of a long journey, was not worth speaking of—and partly strategic. As regarded merchandise there were two points, Lahore and Mooltan, at which it might have to be transladen; but, on the authority of official trade statistics, it was asserted that the quantity of goods liken to be transladen at Mooltan would be practically *nil*, and at Lahore not more, at the outside, than 51,052 tons per annum. Wherefore, fourpence per ton being taken as the representative in cash of the commercial ill-effects of break of gauge, it followed that 51,052 fourpences, or £850 a year, or interest at 5 per cent. on a principal of £17,000, represented the utmost commercial harm that could be done by break of gauge between the Punjab and the rest of India.

The strategic evils were these: First, with the Punjab lines and the metre gauge, all troops and military stores arriving at Lahore, *en route* either for places south of Mooltan, or for places in the direction of Peshawur, would have to change carriages at Mooltan or Lahore. Secondly, however grave the emergency, only the bare rolling stock of the Punjab lines themselves would be available for transport upon them; whereas, if those lines were broad gauge, their rolling stock might be supplemented to any extent by draughts upon the 5,000 miles of broad gauge lines eastward of the Indus. These apprehensions were made light of, as the only conceivable contingencies in which the presence of large masses of troops would be required in the Punjab were such as, like, for instance, a Russian invasion, could not fail to cast their shadows before them so long beforehand, as to allow the Indian Government, with the most complete deliberation, not only to mass whatever troops, artillery, and military stores might be deemed necessary at Lahore as a basis of operations, but also to distribute troops fully equipped amongst whatever advanced posts it might think proper to occupy. Thenceforward the broad gauge railways of the main Indian system would never have to bring up troops to be passed on through Lahore without stopping. Their share in the business of the campaign would consist in maintaining at its proper complement the reserve of men and material at Lahore. Or if, in some unforseen emergency, a regiment ever did arrive by rail at Lahore requiring to be sent forward immediately, the only time lost would be the half-hour or so spent by the men in walking from the broad gauge train to a narrow gauge train, already laden, in anticipation of their arrival, with whatever guns, ammunition, &c., were needed for their full equipment. This occasional half-hour or so would be the only delay (if any) which ever could be caused by break of gauge.

Respecting the restriction of the projected Punjab lines to their own proper rolling stock, and their inability to borrow from the main Indian system, it was, in the first place, to be observed that, even though the Punjab lines were of the standard gauge, it was only carriages and wagons that they could borrow from heavy broad gauge lines. Heavy-line engines could not be permitted to travel upon their light rails; so that, in order to be able to utilise on emergency the borrowed vehicles, it would be necessary always to maintain on the Punjab lines a duly proportioned number of reserve engines to haul them, the enormous expense of which would be a serious objection to borrowing. Secondly. Even though this difficulty did not exist, and even though all the engines and all the vehicles of the 5,000 miles of broad gauge were capable of being used, and available for use, on the Punjab lines, there would be not the smallest occasion for them there. The rolling stock of the Punjab lines themselves would be equal to all possible demands. The neighbourhood of Peshawur, near the entrance of the Khyber Pass, and the neighbourhood of Dadur, at the mouth of the Bolan Pass, were the only two localities at which an European or Europeanised invader, would have to be encountered. Let him, then, be supposed to make his appearance simultaneously at both places, and, to assume an extreme case, let a host of Beloochees be supposed to be at the same time giving trouble anywhere between Kurrachee and Sukkur. Even then no question of moving by rail complete *corps d'armée* could arise. Unless the very genius of folly had presided over the previous dispositions, the despatch for a few days together of a regiment a day, every alternate day, from Lahore towards Peshawur, and from Lahore to Dadur, and of a regiment northwards of Kurrachee, as often as one arrived at that port by sea, was the utmost requirement to be seriously contemplated. Now, although the provision of rolling stock for the future Punjab lines was intended to be much below that of most existing Indian railways—although, while, according Mr. Hawkshaw, the average complement of the latter was abont one engine, with vehicles in proportion for every five miles, the Government authorities were of opinion that, for the lesser traffic of the Punjab, one engine and thirty vehicles for every 13 miles might possibly suffice—yet, even with rolling stock at this exceedingly low rate, it had been demonstrated by careful and minutely detailed calculations, that in the course of a week 12,000 combatants of all arms, infantry, cavalry, and artillery, fully equipped, and with a month's rations, could easily be moved from Lahore to Roree, or 11,000 from Lahore to Peshawur.

At the monthly ballot the following candidates were balloted for and duly elected:—Messrs. J. Fowler (Stockton), P. H. MacAdam, T. Medcalf, and J. W. Sandeman, as members; and Messrs. J. Baldwin, W. Berrell, Stud. Inst. C.E., H. J. Castle, Jun., G. Coates, T. Cooke, M.A., J. M. Dobson, Stud. Inst. C.E., A. G. Fowler, Stud. Inst. C.E., F. W. Cox, C. C. Gibbons, C. B. Goldson, M.A., J. Gordon, H. Gruning. H. Hughes, H. J. Jackson, J. V. Ley, Stud. Inst. C.E., D. H. W. J. N. O'N. Neale, Stud. Inst. C.E., J. W. Peggs, A. F. Phillips, R. J. Quelch, J. Richardson, A. Siemens, Stud. Inst. C.E., J. Steell, and J. H. Waite, as associates. It was announced that the council, acting under the provisions of the bye-laws, had transferred Mr. T. R. Winder from associate to member; and had admitted Messrs. G. N. Abernethy, J. S. Beeman, G. W. Beynon, W. H. Cobley, C. Henfrey, Jun., T. Patch, R. Pickwell, E. S. Ratcliffe, F. Stileman, B. F. Wardell, and W. Wright, as Students of the Institution. The announcement for the next meeting was as follows:—

Tuesday, February 11th, at 8 p.m., Discussion on Mr. Thornton's paper on "The Relative Advantages of the Standard Gauge and of the metre Gauge for the State Railways of India."

ROYAL SOCIETY.

At the meeting on January 30, 1873, G. Busk, Esq., V.P., in the chair, a paper was read by Dr. Bastian on the origin of Bacteria, and on their relation to the process of putrefaction; also, a paper by Mr. R. H. M. Bosanquet on Just Intonation in Music, with a description of a new instrument for the easy control of the notes of the systems of tuning other than the equal temperament of twelve divisions with octave. Likewise, a paper, by Mr. J. Phillips, on the composition and origin of the waters of a salt spring in Huel Seton Mine, with a chemical and microscopical examination of certain rocks in its vicinity.

ZOOLOGICAL SOCIETY OF LONDON.

JANUARY 21st, 1873, Professor Newton, F.R.S., V.P., in the chair. Dr. Günther, F.R.S., exhibited and made remarks on a supposed ancient Egyptian skull. A communication was read from the Rev. John T. Gulick, containing remarks on the classification of the family *Achatinellinæ*; which he regarded as containing ten well-established genera, seven of which were arboreal and three terrestrial in habit. Mr. A. H. Garrod, F.Z.S., read a paper on the visceral anatomy of the Sumatran Rhinoceros (*Ceratorhinus sumatrensis*) based on a specimen of this species lately living in the Society's Gardens.

Mr. A. D. Bartlett gave an account of the birth of a Sumatran Rhinoceros which had taken place on board the *Orchis* at the Victoria Docks on the 7th December, 1872. The mother and an adult male of the animal along with her had been brought from Singapore, but the male had died on the passage. The young one suckled freely and lived for about a fortnight, and was said to have been accidentally killed. A communication was read from Surgeon-Major Francis Day on some new or imperfectly known fishes of India and Burmah. A communication was read from the Rev. O. P. Cambridge on some new genera and species of Araneidea, chiefly from Mr. Thwaites' Ceylonese collections. A communication was read from Dr. J. E. Gray containing a description of the skeleton of the New Zealand Right Whale (*Macleayius australiensis*) and of other whales. Dr. Gray concluded with a general list of the known species of the Marine Mammalia of New Zealand. A communication was read from Mr. G. B. Sowerby, giving descriptions of several new shells of the genus *Conus*. A communication was read from Dr. J. C. Cox, C.M.Z.S., containing descriptions of new land shells from Australia and the Solomon Islands.

For the next meeting of the society for scientific business, to be held at the society's house, in Hanover-square, on Tuesday, the 4th of February, 1873, at half-past eight o'clock, p.m., the following communications were announted as to be then made:—

1.—Mr. B. Meldola.—On a certain class of cases of variable protective colouring in insects. (Received 19th November, 1872.)

2.—Professor J. Allman, F.R.S.—Report on the Hydroida collected during the expeditions of H. M. S. *Porcupine*. (Received 5th December, 1872.)

3.—Mr. George Gulliver, F.R.S.—Measurements of the Red Blood Corpuscles of Batrachians. (Received 6th December, 1872.)

4.—Dr. Günther, F.R.S.—Notes on some Reptiles and Batrachians obtained by Dr. Adolf Bernhard Meyer in Celebes and the Phillippine Islands. (Received 11th December, 1872.

February 4th, 1873, Professor Huxley, F.R.S., V.P., in the chair. A letter was read from the Rev. S. J. Whitmee, of Samoa, Corr. Memb., containing an account of some birds which he was intending to transmit for the society's collection. A letter was read from Mr. Henry W. Piers, late Acting Curator of the South African Museum, Capetown, containing remarks on a specimen of the *Chimæra australis*. Mr. E. Blyth exhibited and made remarks on some tiger skins from India, Burmah, and Siberia. A communication was read from Mr. R. Meldola, containing remarks on a certain class of cases of variable protective colouring in insects. A communication was read from Mr. G. Gulliver, F.R.S., containing a series of measurements of the red blood corpuscles of various batrachians. A paper was read by Dr. A. Günther, F.R.S., containing an account of certain species of reptiles and batrachians, obtained by Dr. A. B. Meyer in Celebes and the Philippine Islands. A communication was read from Mr. A. G. Butler, containing a monographic revision of the genera *Zephronia* and *Sphærotherium* of the sub-order Myriopoda, together with descriptions of some new species of these genera. A communication was read from Mr. G. French Angus, C.M.Z.S., containing descriptions of eight species of land and marine shells from various localities. Messrs. P. L. Sclater and Osbert Salvin read the sixth of a series of papers on Peruvian birds, collected by Mr. H. Whitely, C.M.Z.S., in the Andes of Peru. The present communication contained an account of eighty species, collected principally at Cosnipetz, in the province of Cnzco. A communication was read from Mr. H. Whitely, C.M.Z.S., containing notes on the humming birds collected and observed by him in the Andes of Peru. A communication was read from Dr. J. E. Gray, F.R.S., on the genus Ocadia, which he considered should be referred to the family Bataguridæ.

VICTORIA INSTITUTE.

A MEETING of this Institute took place at its rooms, 8, Adelphi-terrace, on Monday evening. Several new members were elected, and donations to the library announced; after which, Mr. John Eliot Howard read a paper on "Scientific Facts and Christian Evidence," in which he showed the impossibility of scientific men observing what Professor Huxley and the disciples of Comte described as the "first commandment of science," viz., "Give unqualified assent to no propositions but those the truth of which is so clear and distinct that they cannot be doubted." He instanced this by describing the Atomic theory, so valuable to all scientific men in their researches; the undulatory theory of light, and the theory of an imponderable luminiferous ether; besides others: theories which, were we to subject them to the same criticism accorded by the Comtists and others to religion, it would be impossible to prove. Mr. Howard concluded by saying, "Hitherto I have been describing the various modes of arriving at scientific facts, and the measure of credence accorded thereto; but when I turn to Christian evidence, I am on different ground,—that of testimony, first divine, then human. Everything is made to depend on an authoritative testimony,"—not to be received blindly, but studied and examined, so that it may be thoroughly received and believed in, and its disciples ready to give a reason of their belief. Christian evidence, though in many respects different from scientific fact, rested on logical grounds that were not to be overthrown, which were not even touched by the oppositions of science. A discussion followed, in which many members took part, and the following interesting statement was made by Mr. Howard as showing the swiftness with which the thrill of magnetic influence is communicated. On the 1st September, 1859, Messrs. Carrington and Hodgson were observing the sun, one at Oxford and the other in London. Their scrutiny was directed to certain large spots which at that time marked the sun's face. Suddenly a bright light was seen by each observer to break out on the sun's surface, and travel slowly in appearance, but in reality at the rate of about 7,000 miles in a minute across a part of the solar disk. Now it was found afterwards that the self-registering magnetic instruments at Kew had made at that very instant a strongly-marked jerk. It was learned that at that moment a magnetic storm prevailed at the West Indies, in South America, and in Australia. The signalmen in the telegraph stations at Washington to

Philadelphia received strong electric shocks. The pen of Bain's telegraph was followed by a flame of fire, and in Norway the telegraph machinery was set on fire. At night great auroras were seen in both hemispheres.

THE MICROSCOPICAL SOCIETY.

FEBRUARY 4.—Anniversary Meeting. W. K. Parker, President, in the chair.—The Annual Report congratulated the Fellows upon the continued prosperity of the Society, and detailed its progress during the past year, showing that a number of valuable papers had been read and published; considerable additions had been made to the cabinet and library; twenty new Fellows had been elected, and five had been removed by death. The treasurer's statement of accounts was also presented to the meeting, and showed a satisfactory balance in hand. The president then read an address, descriptive of his own further researches upon cranial development, which during the year had been chiefly confined to the formation of the skull and face of the common pig. Having briefly indicated the methods adopted, and some of the results obtained, he expressed the opinion that what he had already observed led him to conclude that if all existing forms had really been derived from one, the process must have been slow indeed, but that he saw reason to more than half suspect that there must have been throughout an overruling Will, and that the whole was fore-ordained. The Annual Report having been adopted, and some discussion having taken place, the meeting terminated.

THE GEOLOGICAL SOCIETY.

JANUARY 22.—His Grace the Duke of Argyll, K.T., president, in the chair.—Messrs. C. F. Strangways, A. Irving, T. L. Dickinson, W. B. Kemshead, J. M'Murtrie, and J. Dawes, jun., were elected Fellows.—The following communication was read: "On the Glaciation of Ireland." by Mr. J. F. Campbell.

THE GEOGRAPHICAL SOCIETY.

JANUARY 27.—Major-General Sir H. C. Rawlinson, president, in the chair.—The papers read were: "Journey from Bunder Abbas to Meshed, by Seistan," by Sir F. Goldsmid. The object of the author's journey was to carry into effect a settlement of the frontiers of Seistan, with which he had been entrusted. He left Bunder Abbas with his party on the 23rd of December, 1871, travelling in an E.N.E. direction, first to Bam. They crossed the mountain range near Dosari, by the pass traversed by Major Murdoch Smith in 1860, viz., the Deh Bakri (7,800 feet above the sea). Beyond Bam and Azizabad the country was fertile. Near Fahraj the central desert begins. Beyond this, to the west, is another tract of mountainous country, bounding the fertile district of Seistan. The author found the frontiers of Seistan indeterminable; the district, consisting of a small, compact area on the eastern side of the Hamun, which is called Seistan Proper, wholly in the possession of Persia, and a larger straggling region, to the east, partly in the possession of Belooch chiefs. The Hamun Lake was found dry, except pools of water at the mouths of the rivers, and the party crossed its southern part, where the bed was perfectly dry. Its limits are well marked by belts of reeds. The waters of the Helmund near, and in the Delta, had been led off by irrigation canals. The area of Seistan Proper was estimated at 974 square miles, and the population at 35,000. Majors St. John and Lovett, R.E., the surveyors attached to the party, had superintended the execution of a new wall-map of Persia, which was exhibited, and which gave a new character to the geography of many parts of Persia. The two great central areas of desert (1,500 to 3,000 feet above the sea-level) were clearly shown, and the snowy ranges running in a N.W. and S.E. direction, nearly parallel to the Persian Gulf, well defined. One of these ranges rises to a height of more than 17,000 feet.—"On the Comparative Geography and Ethnology of Seistan," by the President. Seistan, besides being of political importance as a debatable land, was interesting to the historian. The country physically is dependent entirely on the river Helmud; and it is probable the earliest Arian colonists drew off the whole of the water for irrigation, for in the earliest geographical list, that contained in the Vendidad, the country was called, not from the lake, but from the river. None of the sites of the cities and places named in ancient history could be identified with certainty. Seistan formed the most southerly province of the ancient Arian country of Iran.

FEBRUARY 10.—Major-General Sir H. C. Rawlinson, K.C.B., President, occupied the chair. The following Fellows were elected: Dr. F. Hirth, Messrs. R. E. Large, W. J. Mantle, and J. M. Spence.—The paper was "On Discoveries East of Spitzbergen and Approaches towards the North Pole on the Spitzbergen Meridians," by Mr. C. R. Markham, C.B.—The voyage of Barents, in 1596, was recapitulated, and the honour claimed for him of having been the discoverer of Spitzbergen; but it was argued, contrary to the opinion of some writers, that Barents did not proceed up the eastern side of Spitzbergen, but up the western. Hudson was the next to visit these islands, in 1607, and he was followed in the succeeding years by a succession of whaling adventurers, under the auspices of the Muscovy Company. The most successful of these was Thomas Edge, who discovered and named many islands and inlets, of which a map was given in "Purchas' Pilgrims," but which have been unjustly re-named since, on the erroneous supposition that they were new, by Dutch, German, and other voyagers. After a review of all that had been done, down to the Swedish expeditions, and those of English private gentlemen, Birkbeck, Lamont, and Leigh Smith, in recent years, the author concluded that no ship had ever yet passed round the eastern side of the Archipelago, against which the ice pressed all through the summer, whilst the western and northern shores were free between July and September. To the east and north-east of the islands he believed there was another extensive tract of land or group of islands yet remaining to be visited. He quoted Scoresby and others to show that there was no evidence of the existence of land to the north of the islands, and he believed there was no open sea in the height of summer, but that the loosened ice pressed away southward past Spitzbergen, even from the Pole itself, leaving only lanes and small spaces of open water. He maintained that it was not a route to be recommended for a national expedition making scientific investigations towards the Pole; but that Smith Sound, with its long lines of coast tending northwards, giving the safeguard of the land, was the best route.

THE CHEMICAL SOCIETY.

FEBRUARY 6.—Dr. Williamson, V.P., in the chair.—A communication was made by Dr. H. G. Armstrong, "On the Action of Sodium on Aniline."—A paper, "On Anthrapurpurine," by Mr. W. H. Perkin, was read. Anthrapurpurine is a colouring matter which accompanies alizarine in the crude "artificial alizarine," now so largely manufactured and employed in dyeing instead of madder. Like alizarine, it is capable of imparting brilliant and fast colours to cloth mordanted with alumina or iron.—The last communication, "On Isomerism in the Terpene Family of Hydro-carbons," was read by Dr. C. R. A. Wright. In it he gives an account of his experiments with oil of nutmegs and oil of orange-peel.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

TUESDAY, February 4, 1873. Dr. Birch, F.R.S.L., President, in the chair. Two following Papers were then read:—1. On the Coincidence of the History of Ezra with the first part of the History of Nehemiah. By Rev. Daniel Haigh, M.A.—In this paper the learned chronologist endeavoured to show that Xerxes being the Ahasuerus of Esther, and his wife Amestris, the famous Jewish queen, his son Artaxerxes was assumed at a very early age into co-regency with his father in Persia, while in Babylon he did not date by his regnal years till after the death of Xerxes, at which time, he being thirteen years old, there would consequently arise that difference of chronology between the records of the two kingdoms. In the book of Ezra, the Babylonian era was adopted, whilst in that of Nehemiah the Persian computation is used; upon synchronising the passages contained in Ezra vii. 9—11, and viii. 15, 31, and ix. 1, with Nehemiah i. 1, ii. 1, 3, 9, 18, and viii. 1, &c., it would appear, according to Mr. Haigh, that Ezra started first for Jerusalem, and that at Ahava Nehemiah joined him, about Nisan, B.C. 458, and probably visited Jerusalem for the last time in B.C. 409. 2. On an Assyrian Patera, with an Inscription in Hebrew characters. By Rev. J. M. Rodwell, M.A.—This Patera, one of the finest discovered, was shown by Mr. Rodwell to have been used for purposes of divination, the text beautifully written in square rabbinical Hebrew characters, having reference to magical prognostics; although of late date, it yet represented a large class of more ancient bowls, to which, and the practices based upon them, there were many references in the Scriptures. Some remarks upon a Passage in the Pœnulus of Plautus. By Rev. J. M. Rodwell, M.A.—In this paper the learned author had succeeded, by a new transliteration and arrangement of the words in the famous Phœnician soliloquy, to make a perfectly congruous Hebrew passage, which threw some light upon the reason why king Solomon supplied his Phœnician builders with such large supplies of meal and oil in preference to other commodities. In conclusion, certain Phœnician words were translated, and were shown to occur in an Hebraised form in the Old Testament.

ARCHÆOLOGICAL INSTITUTE.

FEBRUARY 7th, Sir S D. Scott, Bart., V.P., in the chair.—Mr. Fortnum read some notes "On a Roman Key-like Finger-Ring of Gold, and a bi-cephalic Signet of the same Metal," which were illustrated by a series of Roman key-rings in bronze and gold and by two Roman fibulæ of bronze.—Mr. E. A. Freeman gave a discourse upon the "Early Church of Bradford-on-Avon." His attention had been re-directed to this subject by some recently printed remarks, from Mr. J. H. Parker, C.B., on the church of St. Mary, Guildford, in which the latter antiquary stated that "in the interval between A.D. 500 to 1,000 it appears to have been the general custom in most parts of the world to live in wooden houses, and to use wood almost entirely for other buildings also." This was said to be owing partly to the deficiency of skilled workmen and to the general belief that the world would come to an end at the year 1,000. Mr. Freeman controverted this position, showing the existence of many examples of structures in stone on the Continent and in England built within the period named. The small early church at Bradford is another example of those structures, and the evidence of William of Malmesbury, who was a competent authority, that it is the work of the eighth century, is, he thought, fully borne out by the existing remains.—Sir Gilbert Scott considered Mr. Freeman had fully proved his case, and wondered how any-one could doubt the existence of many such early structures. There was no difficulty in deciding between "Norman" and "Pre-Norman" work.

Mr. Dickinson and Mr. Ferrey discussed several points; and Mr. Waller made some remarks on the drapery of the figures in the ornamentation of the church.—Lord Digby sent a bronze brooch lately found in King's County, Ireland. It had a special type of ornamentation and was probably of the ninth century.—The Rev. J. E. Waldy forwarded a sword of one of the De Veres, Earls of Oxford in the time of Charles the First (?).—Mr. Soden Smith brought two early bronze rings of the Roman period which had been found at Silchester, and an antique silver ring, with bronze key attached, having on the bezel a representation of a fisherman and inscription.—The Rev. A. C. Smith sent a Roman dice of bronze, which had lately been found at Wans, in Wiltshire.—The Chairman exhibited a small collection of Roman and other remains, chiefly mediæval, found in the City of London.—The Rev. E. Venables sent a thumb-ring of steel, lined with gold, found in the ruins of the Benedictine Priory of St. Mary Magdalen, Lincoln. The ring was probably of the eighteenth century.—Mr. Spurrell exhibited two flint implements found on the surface at Erith.—Mr. Mathews contributed two bracelets formed of gold coins of the time of Henry the Eighth, Edward the Sixth, and Elizabeth, which had been found in a bag with others, about twenty, hid in the thatch of a cottage at Malpas, Cheshire.

NEW MIXING AND GRINDING APPARATUS FOR INK, &c.

A VESSEL, the interior of which is made in the form of an inverted truncated cone, forms the outer part of the grinder. The inner part of the grinder is also made in the form of an inverted truncated cone, and fits into the interior of the vessel, space being left between the bottoms of said parts for the ink and paint to pass from the centre of the core to its circumference. Upon the top of the core is attached gearing connected with the driving pulley. A tube extends down through the centre of the core. To the upper end of the tube is attached a vessel in which the ink and paints are mixed. A post of a smaller diameter than the interior of the tube passes through the core. The lower end of the post is secured to the bottom of the vessel, and its upper end projects into the mixer. A valve retains the ink or paint in the vessel until it has been thoroughly mixed. To the upper part of the post is rigidly attached a cross bar or scraper, in such a position as to be close to the bottom of the vessel, so that the ink or paint can be thoroughly mixed before it is allowed to flow down into the grinder. The valve moves up and down upon the post. As the ink or paint passes down through the tube into the space between the bottom of the core and the bottom of the vessel, it is forced, by its own gravity and the centrifugal force engendered by the revolution of the core, to pass up between the outer surface of the revolving core and the inner surface of the stationary vessel, being thoroughly rubbed and ground during its passage. In the upper edge of the vessel is a spout, through which the ground ink or paint is discharged into a receiver.

IMPROVED SMUT MILL.

THIS invention relates to a new smut machine in which a vertical shaft, having a series of horizontal disks and vertical wings, is caused to revolve within an upright cylinder of perforated material having horizontal inwardly projecting ribs, so that the disks and wings will throw the wheat or other grain outwardly against the cylinder, while the ribs of the latter will again throw it in towards the shaft, thus reciprocating the grain and insuring the desired result.

IMPROVED SAW FILING APPARATUS.

THIS invention relates to a new grinder machine for sharpening or gumming saws, circular or upright, sharpening moulding bits, or other articles for which emery or grinding wheels are used. The invention consists more particularly in hanging the emery wheel in a jointed frame, which, by virtue of its several joints, is under full and absolute control of the operator, who can therefore set and apply the grinding wheel at any suitable angle to the article to be sharpened.

NEW APPARATUS FOR GRAINING GUNPOWDER.

THIS invention has for its object to facilitate the reduction of gun and blasting powder into grains of the requisite size and configuration; and consists principally in the use of a series of reciprocating knives, which cut the cakes of powder into pieces and gradually reduce the pieces until the desired degree of fineness has been obtained, all without creating waste in the form of dust to such an extent as the same is being created by the devices now in use. The invention also consists in the combination with said reciprocating cutters of adjustable feed devices for moving the powder to be cut, and of means for cleaning the knives of any powder that may adhere to them.

NEW MACHINE FOR BENDING BARS AND TUBES.

THIS invention relates to an improved apparatus for straightening or bending metal bars, shafts, tubes, rods, &c.; and it consists in the combination of a hook, screw, and a bearing plate, forming a clamp adapted to control wearing substances on opposite sides of an article to be bent or straightened, and can be used to draw such surfaces nearer together or spread them further apart until the desired effect has been obtained. The invention is applicable to all shafts, &c., while the same are in lathes or hung in bearings in shops, or in any other position whatever.

IMPROVED CAR AND CABLE COUPLING.

THIS invention relates to a new kind of clamp which is to be attached to railroad cars or other moving devices for connecting them to wire or other cables that are in motion, so that whenever such car or device is by the clamp connected to the cable it will be propelled by the same, while it will remain at rest as soon as disconnected. The invention consists in constructing a clamp of two pivoted jaws which are held apart by an intermediate spring, and can be drawn together against the rope or cable by a cam attachment to a lever that turns on a pin projecting from one of the jaws.

ATTERBURY'S IMPROVEMENTS IN PERMANENT WAY FOR RAILWAYS FOR SEA AND LAND.

WE again call the attention of railway contractors and others to this system of lines for railways, whereby cheapness and durability are, it appears, combined as regards material, in such a manner that a line once laid down, in accordance with this invention, would retain its durability for an indefinite length of time, no wooden sleepers of any kind being used, and the line itself constructed upon a peculiar principle, iron rails, bolts, or chairs, as at present used, not being required, and in case of accident to the carriages, it is affirmed, that the line would not be disturbed or torn up as under the present system of railway lines, where the rails are so often getting out of order that it may be considered that about every five years an entirely new line is laid down by the repeated reparation of the old one. For the Severn Railway, Gloucester, each tube of 12 feet in length, weighing 18 tons at £10 per ton, will cost £180. For five miles the cost would be £131,940 in iron alone.

Mr. Atterbury writes to inform us that this can be effected without stopping the Severn or the sea navigation; after the first segment is put down one mile per day can be constructed on his principle. Mr. Atterbury also remarks that a railway from Dover to Calais, that is, 21 miles, could be constructed on his plan, if the work be carried on without delay, by the latter end of July, 1873.

SINGULAR DEFECT IN AUSTRALIAN GOLD.—It is said that some 6,000 or 7,000 lbs. of Australian gold, known as "brittle," having recently been coined by the French Mint for the Bank of France, all the pieces have been found to admit of being easily broken, and they have, therefore, to be remelted, This is attributed to the presence of a small percentage of antimony and arsenic, extremely difficult of removal; and these elements are known to produce a similar effect in all metals or alloys which are subjected to the molecular changes induced by the pressure and heat developed under the action of the dies in the coming press. A medal, which bears on its obverse the portraits of Dr. Janssen and Mr. Lockyer, and on the reverse the chariot of the sun with Phœbus indicating the prominences of an eclipsed sun has been forwarded to the latter gentleman by the French Government, in commemoration of his discovery of the method of observing the sun's chromosphere without an eclipse.

THE OLDEST INHABITANT.—At Copley House, High-street, Margate, on Thursday, January 30, died Mrs. Frances Dodgson, in the 95th year of her age, having been born, according to the *Thanet Guardian* (of February 1), in October, 1778. She remembered seeing Dr. Samuel Johnson, and the preparations for his funeral, and she possessed a relic of the lexicographer, given by him to her father—a common tin snuff-box, resembling the boxes in which boys used to carry their worms on fishing expeditions some thirty years ago, and perhaps do still. The deceased lady, who seemed not long ago quite likely to live to confute the anti-centenarianists, retaining the use of her faculties, being able to read and write without spectacles, chatty and cheerful almost to the last, was very weakly, and delicate as a child, and was, by medical advice, taken to Margate for the benefit of sea-bathing, which, for some years she continued, as she assured me, all the year through. She could remember Margate when it was scarce one-eighth of its present size; before the new town and much of the old town were built; before the pier, or Jarvis's Landing-place (the old jetty), or the New-road (Marine-terrace) were formed; and when, though comparatively small, Margate was, as described by Brayley, in 1808, "one of the most fashionable and best frequented watering places in the kingdom"; when the only means of getting there from London were the post-chaise, the stage-coach, or the Margate hoy. She could also, of course, remember the exciting times of the first French Revolution, the rise of the Empire, and our war with Napoleon; and she liked to talk about the great events and persons of her earlier days. She was, however (and herein, probably, lay the secret of her longevity), by nature easy-tempered, quiet, unimpressionable, unexcitable, and self-contained, able to do without society, and for many years she lived very much alone, with only a servant in the house, and only occasionally visiting or being visited by a neighbour.—*Antiquary*.

WHEN GEORGE THE THIRD WAS KING.—It is not often given to works to outlive a century and a half, but we understand that Messrs. Dean and Son will shortly issue the 159th edition of "Debrett's Peerage, Baronetage, and Knightage."

POGSON'S COMET.

The discussion about Pogson's Comet is by no means completed. Professor Oppolzer has published another paper on the subject, and is quite convinced that the comet seen by Mr. Pogson moves in the orbit of Biela. Though the times of perihelion passage disagree considerably, and are so far opposed to the theory of the identity of those bodies, the circumstance may, he thinks, be accounted for by the fact that the perturbations acting on Biela's Comet have not been calculated since 1866, when the elements were re-determined by Signor Michez, of Padua, for the appearance which was then expected. But this can hardly account for the whole difficulty; for on this supposition, how is it that the comet was not seen at that return, which was a very favourable one, and when it was most anxiously looked for? At any rate, it is evidently incumbent upon astronomers to carry on the perturbations to the present time; till then, we must suspend our judgment on a matter which is not yet fully understood.

The A B C Sewage Process.—The Native Guano Company, who are working this system, are circulating the following translation of a report of a trial of this manure at the Imperial and Royal Court Gardens of the Emperor of Germany:—"Whilst officially acknowledging the receipt of the manure of the Native Guano Company, Limited, A B C Sewage Process, sent to me in a quantity of six tons, through Mr. Rawson, General Manager, 1, St. Swithin's-lane, London, August 9th, 1871, I have the honour to report, with reference to the results of the comparative experiments which I made with regard to that manure, in the year 1872, that on account of its nutritive constituents, it may be regarded as an excellent regulator of nitrogenous nourishment. Although the easily soluble vegetable nutritious matters of the Native Guano render it peculiarly adapted, as a standard manure, for all fields and all fruits, it would appear that its efficacy, in regard of increasing the crops, is more certain in respect of light soils, but with a proportionably smaller supply than in respect of heavy soils, as the latter require for thorough manuring 10 to 14 cwt. per acre ("*Morgen*"). The Native Guano requires, for its full efficacy, the employment in the first year, consequently in spring, of frequent atmospheric precipitations, as its quicker yield would appear guaranteed by an increased production of leaves, roots, tubers, and grain crops. Although, in general, the year 1872 was characterized by prolonged drought, it was nevertheless certain that the experiments made by me in San Souci, Charlottenhof, the model garden of the Royal Horticultural Teaching Institute, and in the Royal Botanical (Nursery) Establishment, produced very important results. 1st. The yield of such products as potatoes, cabbage, turnips, carrots, and beans was, with a supply of 14 cwt. per acre, a higher one than that obtained on similar soil with stable manure; the potatoes more especially were all compact, large, smooth, and sound. 2nd. For the purpose of producing good grass plots, a top dressing of 12 cwt. per acre in the spring led to excellent results. 3rd. For forced fruit, particularly pine-apples, strawberries, cherries, plums, and grapes, an addition of fifteen parts Native Guano yielded very remarkable results. Judging by these practical results, in respect of cultivation, it will be seen how important is the Company's undertaking, an undertaking which, when carried out to practical use, is, in fact, a question of money for every gardener and agriculturist, and for those reasons I warmly recommend it to the attention of all cultivators of the soil, for the promotion of planting, &c. Sans Souci, the 4th of December, 1872. (Signed) Juhlke, Director of the Court Gardens of His Imperial and Royal Majesty."

Correspondence.

THE CHANNEL PASSAGE, AND MR. BESSEMER'S STEAMER.

To the Editor of the Scientific and Literary Review.

Sir,—The article in the last number of your journal on Mr. Bessemer's Steamer does not inspire us with confidence that the Channel Passage will be much improved by that steamer when afloat. Nor do the projectors of the design seem to have confidence that the sailing qualities of the vessel will make the passage all that is required. When the drawings and models of the swinging cabin were first shown to me by a person at Landport, I pointed out to him the certainty that the pitching and vertical motions of a vessel, fitted with the cabin, would not be in any way prevented. Further, I believed and will believe, for I see no reason to doubt, that when the vessel is swayed to either side by an impinging wave, and the saloon perfectly level, the very circumstance of the saloon being level whilst the hull is inclined, will so alter the centre of gravity, and subsequent righting of the vessel, that the rolling will be continued. But, whatever the capabilities of the vessel may be, she cannot possibly fulfil the requirements of the Channel passage. The requirements that science is asked to provide for that passage are safe, speedy, and uninterrupted transit from coast to coast at any time, in any weather, without the possibility of sea-sickness. No vessel can supply all these. Yet, it is perfectly within the power of engineering science to guarantee them all in the Channel passage. It would be a disgrace to that science if she could not do it. But she cannot, of course, do it unless aided by that combination of capital with invention, without which no important act of science can be properly carried out. That science *can* run a railway train from Bristol to Cardiff, and thus bring Pembroke Dockyard within easy proximity to Portsmouth, London, and Woolwich, is perfectly certain. If from Bristol to Cardiff, then, it is equally clear she can do the same from Dover, Folkstone, or Dungeness, to Calais. Those who know how it should be done will not look upon it as a work of surpassing magnitude to cross to either place. But, though not a work of unapproachable magnitude, it would still be a work of suppassing good, and a patent obtained of profit to those who did it.—I am, Sir, your obedient servant

W. Hempson Denham.

Southsea, Portsmouth, Feb. 17, 1873.

Henry Clayton, Son, and Howlett's Improved Machinery for Moulding Condensed Peat.—A public test of this important invention, which we have already commended to public attention, took place at the Atlas Works, Woodfield-road, Harrow-road, London, W., on Tuesday, the 4th ult., and we understand that the results were of a most satisfactory character.

A New Planet.—Sir G. B. Airy, the Astronomer Royal, has forwarded to the public press a copy of the following telegram, which has been received from Mr. Jos. Henry, Secretary of the Smithsonian Institution, Washington:—"February 18, Planet by Peters, 10 min. 0 sec., north 13 min. 40 sec., motion rapid north, eleventh magnitude."

APPLICATIONS FOR PATENTS.

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to chandelier and general fittings, the means of illumination being otherwise than that of gas.—H. B. Fox. Waterproof garments.—J. T. Grindrod. Floating wrecks and submerged vessels being sailing or steam ships, and other sunken bodies, and apparatus employed therefor.—C. Gall. Steam boiler and other furnaces.—J. McDougall. Manufacture of manures.—T. S. Morris, and G. Skinner. Caster for furniture, also applicable to other purposes.—C. Pettifer.—Apparatus for producing a blast or forcing air, and which apparatus is applicable to the ventilation of mines, buildings, drains, ships, and other purposes.—W. R. Lake. Machinery for separating the dust, bran, and germs from the granulated portions of wheat (com.)—A. M. Clark. Device for ticketing shop goods, and for other purposes (com.)

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